

**The role of local knowledge in community-based flood risk
management in Malawi**

Robert Šakić Trogrlić

Submitted for the degree of Doctor of Philosophy

Heriot-Watt University

School of Energy, Geoscience, Infrastructure and Society

Institute for Infrastructure and Environment

March 2020

The copyright in this thesis is owned by the author. Any quotation from the thesis or use of any of the information contained in it must acknowledge this thesis as the source of the quotation or information.

ABSTRACT

The importance of communities and their local knowledge (LK) in disaster risk reduction is widely discussed in international policy arenas and research agendas. However, studies of practical experiences of community-based approaches remain scarce, as current scholarship is oriented towards mere documentation of LK, and there is a lack of understanding of the extent to which community-based approaches facilitate the uptake of LK. Therefore, this thesis critically explores the role of LK in community-based flood risk management (CBFRM) in Malawi. The qualitative research approach included interviews and focus group discussions with local communities and external stakeholders (non-governmental organisations, government representatives, flood risk management consultants), direct observations in the field, and analysis of secondary data. Data were collected through three periods of fieldwork in 2016 and 2017 in the Lower Shire Valley, the most flood affected area of Malawi, and analysed using thematic analysis.

The findings reveal that local communities have rich and sophisticated LK that assists them in managing localised flooding. Their LK is highly dynamic, continuously refined, and hybrid. Knowledge possession and use are not homogenous within a community and are conditioned by social, economic and political contexts, resulting in differentiated access to LK. There are indications of a decreased reliance on LK due to exogenous processes (e.g. climate change, environmental degradation, penetration of new approaches and technologies), and its effectiveness is challenged by the changing nature of flooding at local levels.

CBFRM in Malawi experiences a number of challenges, both internally created and externally imposed, which result in its limited impact. Some of the core components of good CBFRM practice, such as community participation and sustainability of implemented approaches, are currently lacking. This research finds that LK is underutilised in CBFRM and argues that current practice provides a limited opportunity for the inclusion of LK, due to five prime obstacles: i) current approach to community participation, ii) financial constraints and capacity of external stakeholders, iii) the donor landscape, iv) information consolidation and sharing, and v) external stakeholders attitudes towards LK. In CBFRM, a strong dichotomy between local and scientific knowledge is maintained. The study provides practical advice for improving the existing practice; most notably, it reveals a need for building evidence for LK as a tool for challenging the prevailing attitudes.

DEDICATION

To my beloved mother Jelena Trogrlić.

... This thesis is for you, and is your success as much as my own. It is your sacrifice that gave me an opportunity to study. You gave me wings and taught me how to fly, and all of the worlds' vocabularies lack a word that would sufficiently express my gratitude and love...

Mojoj voljenoj mami Jeleni Trogrlić.

...Ovu tezu posvećujem tebi, i ona je tvoj uspjeh jednako koliko i moj. Zbog tvoje žrtve sam dobio najbolje moguće obrazovanje. Ti si mi dala krila i naučila me letjeti. Ne postoje riječi kojima bih mogao opisati svoju zahvalnost i ljubav...

ACKNOWLEDGEMENTS

I would like to thank my supervisory team: Dr Grant Wright, Prof Adebayo Adelooye and Dr Melanie Duncan. Grant, thank you for giving me freedom to develop this research in the direction of my own interest. I appreciate your fast feedback, openness to ideas, and above all, your friendly attitude. Prof Bayo, thank you for your critical feedback- it helped me shape my ideas better. Mel, enormous thanks for teaching me about the perks of qualitative research and for sharing your experiences of doing interdisciplinary research. Your feedback, friendliness and reassurance in my '*I am going to fail*' phases will never be forgotten, and you made my '*transition*' from an engineer towards an interdisciplinary researcher much easier.

Thanks to Dr Faideess Mwale, a member of supervisory team based in Malawi, for assisting me in organising the fieldwork. To Dr Marc van den Homberg from 510, for always being ready to discuss my research. To Prof Lindsay Beevers for interesting discussions about research during our runs on campus. To Tanja Hendriks, for all interesting discussions about anthropology. To Prof Louise Bracken from Durham University for hosting me at the Institute for Hazards, Risks and Resilience during the write-up phase. To my colleagues from Practical Action, especially Colin McQuistan, for being understanding of a challenge of starting a new job and finalising thesis write-up at the same time.

To my sponsors, the Scottish Government, and their support through the Hydro Nation Scholars Programme. Bob, Barry, John, Laura and Nikki- you are a great team and it was pleasure being your scholar. And of course, thanks to all the other Hydro Nation Scholars- it was great to share this journey with you all. In addition to the Hydro Nation, thanks to the BUFI PhD Programme from the British Geological Survey for taking me in.

To my examiners, Prof John Twigg from University College London and Prof Sarah Johnsen from Heriot-Watt for making the viva voice one of the nicest experiences of my whole journey. Thank you for your suggestions that improved the quality of the final thesis. To Dr Ksenia Chmutina from Loughborough University, for finding time to read my thesis and mock-viva me.

This research would not be possible without all the people in Malawi. I want to thank all the people in the local communities I visited. Your openness and readiness to talk made

this research possible. I will always remember your hospitality and warm welcome. I learned so much from you, and not just about my field of research, but about life, and for that, I am always indebted. Further thanks goes to all the participants from NGOs and governments, who made time for me in their busy schedules. To my research assistants, especially to Joyce, Michael and Humphrey, for making fieldwork so much fun. Furthermore, enormous thanks to the Chawawa's in Blantyre, who became my Malawian family, especially to Nancy.

Many thanks to all the people at Heriot-Watt admin services that made the everyday experience of being a PhD student a pleasant one. Especially, thanks to Anne for being just incredibly helpful with anything, and to Lisa, for being so helpful in organising all of my travelling.

I am blessed to have a strong friend base, which was really important in the 'lows' of my PhD. You are too many to name you all, but thanks to the world's greatest '*fonje*' in Split, my '*Balkan gang*' in Edinburgh, to my '*floodies*' all over the world (especially, the Angels), to all of my lifelong friends from Bosnia, and to all friends from the Water Youth Network. To Sonja, my best friend, just for being her incredibly supporting self. To my PhD '*buddies*', especially Martina, Lydia, Morena and Gabi- we went through this together and our mutual support was a source of strength. To Joanne, for proofreading the thesis and being a constant support.

My family was always my foundation, and I will forever be grateful that I had your support. To my grandparents Jakov and Anka in Bosnia, thank you for raising me and for your limitless faith in me. To my uncle Boris, for being the role model. To Željko, Violeta, Davor, Andrea, Jakov, Marko, Ana, Slavica, Tončo and others. I carry you all wherever I go. Next to my own family, I also want to thank the Jerković (especially my kuma Zdenka) and Bjelošević families, for their support and love over the years.

To Eleftheria: thank you for your faith in me, for choosing me every day and being '*my person*'. Your understanding and support during my write-up phase deserve some kind of a medal.

DECLARATION STATEMENT



Research Thesis Submission

| | | | |
|---------------------------------------------------|----------------------------------------------------------|----------------|----------------------------|
| Name: | Robert Šakić Trogrlić | | |
| School: | School of Energy, Geoscience, Infrastructure and Society | | |
| Version: <i>(i.e. First, Resubmission, Final)</i> | Final | Degree Sought: | Doctor of Philosophy (PhD) |

Declaration

In accordance with the appropriate regulations I hereby submit my thesis and I declare that:

1. The thesis embodies the results of my own work and has been composed by myself
2. Where appropriate, I have made acknowledgement of the work of others
3. The thesis is the correct version for submission and is the same version as any electronic versions submitted*.
4. My thesis for the award referred to, deposited in the Heriot-Watt University Library, should be made available for loan or photocopying and be available via the Institutional Repository, subject to such conditions as the Librarian may require
5. I understand that as a student of the University I am required to abide by the Regulations of the University and to conform to its discipline.
6. I confirm that the thesis has been verified against plagiarism via an approved plagiarism detection application e.g. Turnitin.

ONLY for submissions including published works

Please note you are only required to complete the Inclusion of Published Works Form (page 2) if your thesis contains published works)

7. Where the thesis contains published outputs under Regulation 6 (9.1.2) or Regulation 43 (9) these are accompanied by a critical review which accurately describes my contribution to the research and, for multi-author outputs, a signed declaration indicating the contribution of each author (complete)
 8. Inclusion of published outputs under Regulation 6 (9.1.2) or Regulation 43 (9) shall not constitute plagiarism.
- * Please note that it is the responsibility of the candidate to ensure that the correct version of the thesis is submitted.

| | | | |
|-------------------------|--|-------|------------|
| Signature of Candidate: | | Date: | 23/03/2020 |
|-------------------------|--|-------|------------|

Submission

| | |
|-------------------------------------|--|
| Submitted By (name in capitals): | |
| Signature of Individual Submitting: | |
| Date Submitted: | |

For Completion in the Student Service Centre (SSC)

| | | | | | | | | | | |
|--------------------------------------------------------|-----------|-----|--|----|--|----------|-----|--|----|--|
| Limited Access | Requested | Yes | | No | | Approved | Yes | | No | |
| E-thesis Submitted (mandatory for final theses) | | | | | | | | | | |
| Received in the SSC by (<i>name in capitals</i>): | | | | | | Date: | | | | |

Inclusion of Published Works

Please note you are only required to complete the Inclusion of Published Works Form if your thesis contains published works under Regulation 6 (9.1.2)

Declaration

This thesis contains one or more multi-author published works. In accordance with Regulation 6 (9.1.2) I hereby declare that the contributions of each author to these publications is as follows:

| | |
|------------------|--------------------------------------------------------------------------------|
| Citation details | e. g. Author 1 and Author 2, Title of paper, Title of Journal, X, XX-XX (20XX) |
| Author 1 | Contribution.... |
| Author 2 | Contribution.... |
| Signature: | |
| Date: | |

TABLE OF CONTENTS

| | |
|-------------------------------------------------------------------------------------------------|-------------|
| ABSTRACT | ii |
| DEDICATION..... | iii |
| ACKNOWLEDGEMENTS..... | iv |
| DECLARATION STATEMENT..... | vi |
| TABLE OF CONTENTS..... | viii |
| LISTS OF TABLES | xii |
| LISTS OF FIGURES | xiii |
| LIST OF ABBREVIATIONS | xv |
| LIST OF PUBLICATIONS BY THE CANDIDATE | xvii |
| Chapter 1 - Introduction | 1 |
| 1.1 Background to the study | 1 |
| 1.2 Research context..... | 3 |
| 1.3 Research problem and study rationale..... | 4 |
| 1.4 Research aim and objectives | 6 |
| 1.5 Research approach..... | 6 |
| 1.5.1 Outline of the adopted approach | 6 |
| 1.5.2 Interdisciplinary and applied nature of the research project | 7 |
| 1.6 Thesis outline | 8 |
| Chapter 2 - Literature review | 9 |
| 2.1 Theoretical concepts in disaster research | 9 |
| 2.1.1 Disasters and disaster risk | 9 |
| 2.1.2 Resilience | 16 |
| 2.2 Disaster risk management approaches | 17 |
| 2.2.1 From top-down and hazard-centred, to bottom-up and vulnerability-centred approaches | 17 |
| 2.2.2 From managing disasters to managing disaster risks | 20 |
| 2.3 Community-based disaster risk reduction (CBDRR)..... | 22 |
| 2.3.1 Defining ‘community’ | 22 |
| 2.3.2 Defining community-based disaster risk reduction | 24 |
| 2.3.3 Key concepts behind community-based disaster risk reduction | 25 |
| 2.3.4 The process of delivering community-based disaster risk reduction in practice | 29 |
| 2.3.5 Benefits and challenges of community-based disaster risk reduction | 32 |
| 2.4 Local knowledge | 35 |
| 2.4.1 Defining local knowledge | 35 |
| 2.4.2 Characteristics of local knowledge | 37 |
| 2.4.3 Local knowledge in disaster risk reduction..... | 39 |
| 2.4.4 Integration between local and scientific knowledge | 42 |
| 2.4.5 Benefits and limitations of local knowledge | 47 |
| 2.5 Flooding and local knowledge in Malawi | 49 |
| 2.5.1 Flooding in Malawi | 49 |

| | | |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------|
| 2.5.2 | Current approaches to flood risk management..... | 53 |
| 2.5.3 | Local knowledge for flooding in Malawi..... | 57 |
| 2.6 | Chapter summary | 58 |
| Chapter 3 - Methodology..... | | 60 |
| 3.1 | Research philosophy and methodological choice..... | 60 |
| 3.1.1 | Ontological and epistemological stance..... | 60 |
| 3.1.2 | Selection of a qualitative methodological approach | 61 |
| 3.2 | Case study research design..... | 62 |
| 3.3 | Overview of research instruments used for data collection..... | 63 |
| 3.4 | Ethical considerations and researchers positionality | 66 |
| 3.5 | Introducing the Lower Shire Valley: Nsanje and Chikwawa..... | 68 |
| 3.5.1 | Background information on the districts..... | 68 |
| 3.5.2 | Flooding in the districts..... | 70 |
| 3.6 | Overview of fieldwork | 72 |
| 3.6.1 | Three stages of fieldwork..... | 72 |
| 3.6.2 | Gaining research permission in Malawi..... | 74 |
| 3.6.3 | Research assistants | 74 |
| 3.6.4 | Choice of case study areas | 75 |
| 3.6.5 | Overview of different stakeholder groups included in the research | 77 |
| 3.6.6 | Sampling and selection of research participants | 79 |
| 3.6.7 | Overview of the questions in the interviews and focus group discussions 81 | |
| 3.6.8 | Conducting FGDs and interviews with the communities | 81 |
| 3.6.9 | Conducting FGDs and interviews with the government and NGOs | 84 |
| 3.6.10 | Direct observations through field visits | 85 |
| 3.6.11 | Collecting and using secondary data..... | 86 |
| 3.6.12 | Challenges encountered during fieldwork | 87 |
| 3.7 | Data analysis..... | 88 |
| 3.7.1 | Analysis of data collected through interviews and FGDs..... | 88 |
| 3.7.2 | Analysis of secondary data..... | 91 |
| 3.8 | Validity and reliability precautions | 91 |
| 3.9 | Chapter summary | 93 |
| Chapter 4 - Community-based flood risk management in Malawi: setup, stakeholder roles and challenges | | 94 |
| 4.1 | Legal and policy framework..... | 94 |
| 4.1.1 | Legal framework | 95 |
| 4.1.2 | Policy framework | 95 |
| 4.1.3 | Communities and local knowledge in the current policy and legislation . | 97 |
| 4.2 | Institutional framework | 99 |
| 4.2.1 | General administrative and governance setup..... | 99 |
| 4.2.2 | Institutional setup for disaster risk reduction..... | 100 |
| 4.3 | Understanding the modes of working between different stakeholders | 102 |
| 4.3.1 | Interactions at district levels..... | 103 |
| 4.3.2 | Interactions at community levels | 104 |
| 4.4 | Examples of projects implemented by the government and NGOs | 105 |
| 4.4.1 | Government projects | 105 |
| 4.4.2 | NGO projects | 107 |
| 4.5 | Challenges for community-based flood risk management in Malawi..... | 109 |
| 4.5.1 | Challenges for local communities..... | 110 |
| 4.5.2 | Challenges for non-governmental organisations..... | 113 |
| 4.5.3 | Challenges for government | 117 |

| | | |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------|
| 4.5.4 | NGOs and government challenges with local communities | 120 |
| 4.6 | Chapter summary | 123 |
| Chapter 5 - Mapping local knowledge for flood risk management | | 127 |
| 5.1 | Dimensions of local knowledge for flood risk management..... | 127 |
| 5.2 | Crosscutting theme: knowledge of flood hazard | 128 |
| 5.2.1 | Types of flooding and flood characteristics | 128 |
| 5.2.2 | Flood causes | 131 |
| 5.2.3 | Changes in flooding | 133 |
| 5.3 | Local knowledge before the flood | 134 |
| 5.3.1 | Local early warning indicators for flooding..... | 134 |
| 5.3.2 | Early action | 143 |
| 5.3.3 | Risk reduction strategies | 149 |
| 5.4 | Local knowledge for during the flood | 151 |
| 5.4.1 | Evacuation means and location..... | 151 |
| 5.4.2 | Monitoring, dissemination and the decision to evacuate | 153 |
| 5.4.3 | Other local strategies employed during the flood | 154 |
| 5.5 | Local knowledge for after the flood | 155 |
| 5.6 | Crosscutting themes: roles of local institutions, leaders and social capital.... | 157 |
| 5.6.1 | The roles of local institutions and leaders..... | 157 |
| 5.6.2 | The role of social networks | 159 |
| 5.7 | Chapter summary | 160 |
| Chapter 6 - Communities and local knowledge..... | | 162 |
| 6.1 | Community views on local knowledge | 162 |
| 6.1.1 | Benefits of local knowledge | 163 |
| 6.1.2 | Limitations of local knowledge..... | 165 |
| 6.1.3 | Changes to local knowledge..... | 169 |
| 6.2 | Community views on external knowledge | 172 |
| 6.2.1 | Contrasting local and external knowledge | 172 |
| 6.2.2 | Integration of local and external knowledge..... | 178 |
| 6.2.3 | Perceptions of external stakeholders attitudes to local knowledge | 180 |
| 6.3 | Factors influencing the community use of local knowledge | 183 |
| 6.3.1 | Age | 183 |
| 6.3.2 | Gender | 184 |
| 6.3.3 | Education..... | 185 |
| 6.4 | Chapter summary | 186 |
| Chapter 7 - External stakeholders and local knowledge | | 188 |
| 7.1 | External stakeholders' views on local knowledge | 188 |
| 7.1.1 | Awareness of local knowledge | 188 |
| 7.1.2 | Benefits of local knowledge | 190 |
| 7.1.3 | Limitations of local knowledge..... | 194 |
| 7.1.4 | Changes to local knowledge..... | 201 |
| 7.1.5 | Unrevealed attitudes: local knowledge as backwards..... | 202 |
| 7.2 | External stakeholders' use of local knowledge | 203 |
| 7.2.1 | Explicit use of LK | 204 |
| 7.2.2 | Implicit use of LK | 206 |
| 7.2.3 | Lack of integration of local knowledge | 207 |
| 7.3 | Externals stakeholders' recommendations for enhancing the role of local knowledge..... | 209 |
| 7.4 | Chapter summary | 212 |

| | |
|-------------------------------------------------------------------------------------------------------------------|------------|
| Chapter 8 - Discussion | 215 |
| 8.1 Reflection on local knowledge for flood risk management in Malawi | 215 |
| 8.2 The obstacles in current CBFRM for the use of local knowledge | 216 |
| 8.2.1 Community participation practices | 217 |
| 8.2.2 Financial constraints and capacity of NGOs and government | 219 |
| 8.2.3 The donor landscape | 220 |
| 8.2.4 Information consolidation and sharing | 221 |
| 8.2.5 External stakeholders' attitudes | 222 |
| 8.3 Process perspectives of local knowledge | 224 |
| 8.4 The critical outlook on local knowledge | 227 |
| 8.4.1 Socio-economic and political dimensions of local knowledge | 227 |
| 8.4.2 Diversity of views on local knowledge | 228 |
| 8.4.3 External pressures on local knowledge | 228 |
| 8.4.4 Local knowledge and underlying causes of vulnerability | 229 |
| 8.5 Power relations in community-based flood risk management | 231 |
| 8.6 Towards the enhanced use of local knowledge for community-based flood risk management in Malawi | 233 |
| 8.6.1 Recommendations for improving the current approaches | 233 |
| 8.6.2 Building evidence for LK as a tool for changing the attitudes | 237 |
| 8.7 Chapter summary | 245 |
| Chapter 9 - Conclusions | 247 |
| 9.1 Summary of the main findings | 247 |
| 9.1.1 Community-based approaches to flood risk management | 247 |
| 9.1.2 The concept of local knowledge for flood risk management | 248 |
| 9.1.3 Local knowledge in community-based flood risk management | 250 |
| 9.2 Thesis contributions | 252 |
| 9.2.1 Contributions to knowledge | 252 |
| 9.2.2 Contributions to policy | 253 |
| 9.2.3 Contributions to practice | 253 |
| 9.3 Research limitations | 254 |
| 9.4 Recommendations for further research studies | 255 |
| Appendix 1: The approval obtained by local government for conducting research in Chikwawa and Nsanje | 257 |
| Appendix 2: Overview of case studies and research participants | 259 |
| Appendix 3: Questions used for data collection | 261 |
| Appendix 4: Information Sheet and Consent Form | 269 |
| Appendix 5: Short survey for NGOs and local government during the scoping study fieldwork | 270 |
| Appendix 6: List of early warning indicators documented during the consultancy study | 272 |
| Appendix 7: List of early warning indicators documented during the main fieldwork | 277 |
| REFERENCES | 280 |

LISTS OF TABLES

| | |
|----------------------------------------------------------------------------------------------------------------------------|-----|
| Table 2.1 Definitions of disaster management, disaster risk management and disaster risk reduction | 20 |
| Table 2.2 Some definitions of community-based disaster risk reduction | 25 |
| Table 2.3 Challenges with existing early warning systems in Malawi | 55 |
| Table 3.1 Research instruments in relation to research objectives | 64 |
| Table 3.2 Overview of interviews and FGDs with government, NGOs and FRM consultants at district and national levels | 78 |
| Table 3.3 Criteria used for purposive sampling in different fieldwork stages | 80 |
| Table 3.4 Main themes discussed with different stakeholder groups during fieldwork | 82 |
| Table 4.1 Reference to local knowledge in Malawi's legal and policy documents | 98 |
| Table 4.2 The role of national-level bodies involved in DRR efforts | 102 |
| Table 4.3 Overview of large scale FRM projects in Malawi | 106 |
| Table 4.4 Summary of challenges for CBFRM identified by each stakeholder group against another group | 125 |
| Table 5.1 Causes of flooding as identified by research participants | 132 |
| Table 5.2 Overview and examples of different early warning indicators | 135 |
| Table 5.3 Overview of early action categories | 144 |
| Table 5.4 The role of local level institutions and traditional leaders | 157 |
| Table 6.1 Summary of changes to local knowledge | 169 |
| Table 6.2 Examples of different dimensions of integration between local and external knowledge | 179 |
| Table 7.1 External stakeholders perceived benefits of local knowledge | 191 |
| Table 7.2 External stakeholders perceived limitations of local knowledge | 195 |
| Table 7.3 Examples of explicit use of local knowledge by external stakeholders | 204 |

LISTS OF FIGURES

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 2.1 The Pressure and Release model | 12 |
| Figure 2.2 Circle of capacities | 14 |
| Figure 2.3 Integrated disaster risk reduction framework | 20 |
| Figure 2.4 The disaster cycle | 22 |
| Figure 2.5 Structural and non-structural measures for managing flood risk | 23 |
| Figure 2.6 The seven steps process of CBDRR | 30 |
| Figure 2.7 Four pillars of local knowledge in DRR | 40 |
| Figure 2.8 Process framework for knowledge integration | 45 |
| Figure 2.9 Framework for integration of LK and SK | 46 |
| Figure 3.1 Geographic location of the case study area | 69 |
| Figure 3.2 Overview of flood risk in Nsanje and Chikwawa | 71 |
| Figure 3.3 Overview of fieldwork stages | 72 |
| Figure 3.4 Geographical locations of case study areas where the consultancy assignment (a) and the main fieldwork (b) were conducted | 76 |
| Figure 3.5 Process for selecting case studies for the main period of fieldwork | 77 |
| Figure 3.6 Some photographs from GVH Kanseche: a) a place where a house collapsed during floods, and b) location where Mwanza River breaks into the village | 86 |
| Figure 3.7 Photographs from field visits with consultants: a) drift construction in GVH Gooke and b) hydrometric scale in Mwanza River | 86 |
| Figure 3.8 Schematic representation of the procedure used during data analysis | 89 |
| Figure 3.9 Example of coding from NVivo | 90 |
| Figure 4.1 Administrative and traditional governance layers in Malawi | 99 |
| Figure 4.2 National disaster risk management structure | 101 |
| Figure 4.3 Interactions between core stakeholders | 103 |
| Figure 4.4 Some images from the sites of government-led projects a) villagers discussing dike design with consultants in GVH Nafafa, b) automated river gauge at Shire River, c) replanting of vertiba grass GVH Monica d) dike constructed as a part of the Malawi Flood Recovery Emergency Project, e) dike construction in GVH Tengani | 107 |

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 4.5 Examples of projects implemented as a part of CB-FRM: a) community-based dike, b) evacuation centre, c) rainfall gauge, d) water level gauge, e) reforestation | 108 |
| Figure 5.1 Dimensions of local knowledge for flood risk management in Malawi | 128 |
| Figure 5.2 A woman in GVH Kanseche indicating water levels during a) extreme flooding, and b) annual flooding | 130 |
| Figure 5.3 Example of trees used as local indicators: a) Nyanga tree in GVH Misili, b) Mango tree in GVH Kanseche | 139 |
| Figure 5.4 Example of livestock management strategies: a) ' <i>Kraal</i> ' for chicken in GVH Tengani, and b) raised platform for goats in GVH Kanseche | 146 |
| Figure 5.5 Example of temporary shelters used for early evacuation and relocation: a) raised platform in GVH Kanseche, and b) temporary shelter in GVH Misili | 147 |
| Figure 5.6 Typical houses in the Lower Shire Valley a) a house built with burnt bricks in GVH Misili, and b) a house in GVH Tizola built with mud bricks, also showing the ' <i>chiguwa</i> ' surrounding the foundations | 149 |
| Figure 5.7 Example property level flood protection: a) reinforcement of foundations in GVH Mmodzi, and b) a house in GVH Misili with a raised foundation | 150 |
| Figure 5.8 Examples of river protection works from GVH Mmodzi: 1) check dams, and b) a dyke | 151 |
| Figure 5.9 a) Canoes in GVH Nyanga b) Anthill in GVH Kanseche | 153 |
| Figure 7.1 Overview of external stakeholders' recommendations for enhancing the role of local knowledge | 210 |
| Figure 8.1 Recommended steps for building evidence for local knowledge | 237 |

LIST OF ABBREVIATIONS

(I)NGO- (International) Non-Governmental Organisation

ACPC- Area Civil Protection Committee

ADC- Area Development Committee

C- Capacity

CBDRR- Community-Based Disaster Risk Reduction

CBEWS- Community-Based Early Warning System

CBFRM- Community-Based Flood Risk Management

CBO- Community-Based Organisation

DC- District Council

DCPC- District Civil Protection Committee

DEC- District Executive Committee

DM- Disaster Management

DMSCC- Department of Climate Change and Meteorological Services

DoDMA- Department of Disaster Management Affairs

DPRA- Disaster Preparedness and Relief Act

DR- Disaster Risk

DRM- Disaster Risk Management

DRMA- Disaster Risk Management Act

DRR- Disaster Risk Reduction

EW- Early Warning

FDG- Focus Group Discussion

FRM- Flood Risk Management

GCM- Global Circulation Model

GFDRR- Global Facility for Disaster Reduction and Recovery

GV- Group Village

GVH- Group Village Head

H- Hazard

IDNDR- International Decade for Natural Disaster Reduction

ITCZ- Inter Tropical Convergence Zone

KII- Key Informant Interview

LK- Local Knowledge

LULC- Land Cover and Land Use

MGDS- Malawi Growth and Development Strategy

MRCS- Malawi Red Cross Society

NAPA- National Adaptation Programme of Action
NCCMP- National Climate Change Management Policy
NDRMP- National Disaster Risk Management Policy
NGCBFRM- National Guidelines for Community-Based Flood Risk Management
PAR- Participatory Action Research
PDRA- Participatory Disaster Risk Assessment
PDRMP- Participatory Disaster Risk Management Planning
PLA- Participatory Learning and Action
PRA- Participatory Rural Appraisals
PSP- Participatory Scenario Planning
PVCA- Participatory Vulnerability and Capacity Assessment
RA- Research Assistant
RRA- Rapid Rural Appraisals
SK- Scientific Knowledge
TA- Traditional Authority
UN- United Nations
UNDRR- United Nations Office for Disaster Risk Reduction
V- Vulnerability
VCPC- Village Civil Protection Committee
VDC- Village Development Committee
VSL- Village Savings and Loans

LIST OF PUBLICATIONS BY THE CANDIDATE

Journal papers

- Šakić Trogrlić R., Wright, G., Duncan, M., Van Den Homberg, M., Adeloye, A., Mwale, F., Mwafulirwa, J. 2019 Characterising local knowledge across the flood risk management cycle: a case study of Southern Malawi. *Sustainability* 11(1681) p.1-23 [DOI:10.3390/su11061681](https://doi.org/10.3390/su11061681)
- Šakić Trogrlić R., Wright, G., Adeloye, A., Duncan, M., Mwale F. 2018 Taking stock of community-based flood risk management in Malawi: different stakeholders, different perspectives. *Environmental Hazards* 17(2), p. 107-127 [DOI:10.1080/17477891.2017.1381582](https://doi.org/10.1080/17477891.2017.1381582)

Conference paper (peer-reviewed)

- Šakić Trogrlić R., Wright, G., Adeloye, A., Duncan, M., Mwale F. 2017 Community-based flood risk management: experiences and challenges in Malawi. *XVI World Water Congress* May-June 2017 Cancun, Mexico

Book Chapter

- Innes, E., Šakić Trogrlić R., Beevers, L. (under review) *Social Vulnerability to Droughts in Rural Malawi*.

Conference presentations

- Šakić Trogrlić, R., Duncan, M., Wright, G., Adeloye, A., van den Homberg, M. *The use of local knowledge in disaster risk reduction: development partners' perceptions*. August 2019 Annual Royal Geographical Society Conference in London, United Kingdom
- Šakić Trogrlić, R., Wright, G., Adeloye, A., Duncan, M., Mwale, F. *Local knowledge, flood risk management and external stakeholders: Malawian experience*. November 2018 8th International Conference on Building Resilience in Lisbon, Portugal
- Šakić Trogrlić, R. *What do the vulnerable know? Perspectives on the local knowledge of flooding in Malawi*. November 2018 The culture of too much water- commonalities and differences of social and cultural dealing with floods in Berlin, Germany

- Šakić Trogrlić R., Wright, G., Adeloye, A., Duncan, M., Mwale F. *Community perceptions of local knowledge for community-based flood risk management*. July 2018 XIX ISA World Congress of Sociology in Toronto, Canada
- Šakić Trogrlić R., Wright, G., Adeloye, A., Duncan, M., Mwale F. *Local Knowledge in Community-Based Flood Risk Management: Perspectives from the Lower Shire Valley in Malawi*. September 2017 Institute of Hazard, Risk and Resilience (Durham University) Conference in Durham, United Kingdom
- Šakić Trogrlić R., Wright, G., Adeloye, A., Duncan, M., Mwale F. *Community-based flood risk management: experiences and challenges in Malawi*. May 2017 XVI World Water Congress in Cancun, Mexico

Consultancy report

- Šakić Trogrlić R., Van den Homberg, M. 2018 *Indigenous knowledge and early warning systems in the Lower Shire Valley in Malawi*. 510 An Initiative of the Netherlands Red Cross

Blogs

- Šakić Trogrlić R., 2019 [Why Malawi is failing to protect people from floods and what needs to be done?](#). *The Conversation*
- Šakić Trogrlić R., 2019 [Local knowledge in flood risk management: are we only paying it lip service?](#) *Flood Resilience Portal*

Chapter 1- Introduction

1.1 Background to the study

Disasters are a global phenomenon causing havoc both in developing and developed countries, and there is a clear need for collective action in order to build the resilience of people and nations. In response to this situation, the international community has taken decisive steps; global agreements such as Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) are setting ambitious goals in reducing disaster risks at all levels, from local to global (UNDRR 2015). However, despite this commitment, disasters continue to increase in frequency and intensity and exposure to natural hazards is growing at a faster rate than vulnerability is decreasing (*ibid.*). Recently, the United Nations Office for Disaster Risk Reduction (UNDRR) has reported that there is one climate-related disaster (e.g. flood, drought) happening every week (Harvey 2019).

Flooding is the most common of all natural hazards, with flood impacts being most severely felt in the Global South (Tanoue et al. 2016, Jongman 2018), where the overall development of people and nations is compromised. In these countries, levels of vulnerability to flooding are high and people are often trapped in a vicious disaster-poverty cycle. Impacts of floods are most profound at local levels, where communities at risk have the most to lose when disaster strikes (Jahangiri et al. 2011).

However, communities experiencing frequent flooding and other natural hazards are not helpless victims, but also innovative agents that have devised a creative set of strategies that allow them to live in areas affected by disasters. They possess invaluable local knowledge (LK) that helps them to prepare and manage crises caused by natural hazards (Wisner et al. 1977, Cuny 1991, Hiwasaki et al. 2014a). In the broadest sense, LK is what local communities know about natural hazards related risks, how they perceive these risks, and what actions they take to address them (Dekens 2007). It includes knowledge of hazards, vulnerabilities, and capacities (Kelman et al. 2012), forms a part of community resilience to disasters (López-Marrero and Tschakert 2011, Hooli 2016), and is a basis for locally deployed strategies for managing risks of natural hazards (Iloka 2016). LK is especially valuable for communities exposed to recurrent flooding, as they have developed culturally embedded knowledge on how to live with floods over many generations (Tran, Shaw, et al. 2009).

Previously receiving scarce attention, mainly due to technocratic nature of traditional disaster risk reduction (DRR) (Oliver-Smith 2016), LK is now gaining rising prominence (Salite 2019a). This interest became especially apparent after the 2004 Indian Ocean Tsunami, when local responses that helped indigenous communities survive were widely shared, sparking research interest in LK (Gaillard et al. 2008, Shaw et al. 2009a, Hiwasaki et al. 2014a). Similarly, the importance of LK is echoed in global policies (Lambert and Scott 2019). For instance, SFDRR recognises the need to include local, traditional and indigenous knowledge in disaster risk assessments and design of locally-appropriate plans and policies (UNDRR 2015), whereas the Paris Agreement (UNFCCC 2015) sees LK as an option for adapting to climate change impacts. Similarly, a recent report from the International Panel on Climate Change (IPCC) on the 1.5° C warmer world reinforces the importance of LK as an adaptation option to reduce climatic risks (IPCC 2018).

In terms of approaches to deal with disaster risks, LK is an important aspect of a specific approach, namely community-based disaster risk reduction (CBDRR)¹. CBDRR emerged as an alternative approach to top-down and technocratic approaches that have failed to tangibly improve the situation and have been designed detached from local contexts and with a lack of participation of local communities (Scolobig et al. 2015). In CBDRR, local communities and their participation are at the centre (Delica-Willison and Gaillard 2012, Twigg 2015, Shaw 2016); in other words, communities are active subjects in the process rather than passive objects and mere recipients of external interventions (Maskrey 1989, 2011). Through a process of CBDRR, communities at risk identify and prioritise their problems, as well as select contextually appropriate solutions. CBDRR recognises that local communities have abundant LK that can be used to effectively reduce the risks and impacts of hazardous events (Dekens 2007, Dumaru 2010, Gaillard and Mercer 2013, Cretney 2016). Although the approach has been present for almost three decades, its importance is increasing (Van Niekerk et al. 2018), which can be explained by increased challenges at local levels brought about by global environmental change, and an ever-increasing rhetoric of the importance of community inclusion in DRR. In their recent research, Izumi et al. (2019), by surveying representatives of academia, government, private sector and non-governmental organisations (NGOs), concluded that CBDRR is the most effective innovation in the field of DRR.

¹ In this thesis, a hazard-specific approach of CBDRR is researched: Community-Based Flood Risk Management (CBFRM). While CBDRR is used to describe the theoretical postulates of the approach, CBFRM is approach analysed in the case study of the Lower Shire Valley in Malawi.

Despite the rise of CBDRR and the increased recognition of the importance of LK in DRR, there are strong indications that practice is lagging behind theoretical advancements. Very often, community participation is just mere rhetoric, while approaches on the ground still resemble top-down actions (Mercer et al. 2008, Tozier de la Poterie and Baudoin 2015, Van Niekerk et al. 2018, Coles and Quintero-Angel 2018), with local communities often denied the opportunity to meaningfully participate and be included as equal partners (Rose and Jayawickrama 2016). In terms of LK in particular, the situation is equally concerning. Many authors strongly argue that the rhetorical recognition of LK does not translate into its extensive inclusion in DRR approaches (Heijmans 2012, Kenney and Phibbs 2015, Iloka 2016, Dube and Munsaka 2018). Still, LK is largely disregarded in favour of technical approaches and expert, scientific or ‘Western’ knowledge, both in practical and policy arenas (Mitchell et al. 2016, Coles and Quintero-Angel 2018, Sonia Lin and Chang 2019).

Taking into account both the increasing importance of CBDRR and LK, and their intertwined relationship, as well as a rising critique that theoretical propositions do not match practical realities on the ground, there is a need to provide additional insights and evidence on these topics. Therefore, this thesis engages with the understanding of LK under the umbrella of community-based flood risk management (CBFRM) in Malawi.

1.2 Research context

Malawi presents an interesting case study for studying community-based approaches since CBFRM is a commonly employed approach for dealing with flood risks in the country (Kita 2017a). Similar to other developing countries, there are scarce governmental resources available to implement large-scale flood risk management interventions (FRM); therefore, the government is highly dependent on international aid, resulting in a large number of international, national and local NGOs implementing CBFRM projects in flood prone areas through donor-funded packages (Nillson et al. 2010, Chiusiwa 2015). This is especially evident in the Lower Shire Valley in southern Malawi (Chikwawa and Nsanje districts), which is the case study for the present research.

Malawi has a long-standing problem with flooding. The country is amongst the most vulnerable to climatic shocks and impacts of climate change in Africa (Barrett 2013, Warnatzsch and Reay 2019). It is a small, landlocked country, ranked as the third poorest in the world (International Monetary Fund 2018), with 51.5% of population living below

the poverty line (The World Bank 2017). Malawi's economic situation is in no small part due to flooding and other natural hazards (e.g. droughts, dry spells, landslides), the impacts of which stifle development. For instance, floods occur in 16 out of the country's 25 districts (UNECA 2015), and there is a reported increase in flood frequency, magnitude and impacts (Chidanti-Malunga 2011, Botha et al. 2018). A recent analysis by the Global Facility for Disaster Reduction and Recovery (GFDRR 2019) reported that around 100,000 people are affected by flooding on an annual basis. In addition to typical annual flooding, Malawi experiences extreme floods. Most recently, in March 2019, Cyclone Idai brought destruction across the country by killing 60 people and affecting close to one million (Government of Malawi 2019). The flooding of 2019 came while the country was still recovering from the devastating floods of January 2015 where close to 1.2 million people were affected and around 170 casualties were reported (Government of Malawi 2015a, Rudari et al. 2016).

In a setting such as the Lower Shire Valley, which is the most flood prone area of the country, communities are exposed to frequent flooding, and people have rich LK born out of continuous and long-lasting experience. However, although acknowledged in the literature (Shela et al. 2008, Nillson et al. 2010, Mwale et al. 2015), there is a lack of studies explicitly focusing on the role LK plays in FRM in the country. Therefore, the case study offers an opportunity to fill in this gap and contribute to knowledge by generating new empirical evidence. Moreover, taking into account the predominance of CBFRM approaches in the Lower Shire Valley and dense presence of development partners working with communities, it offers an opportunity to engage in understanding the interplay between LK and CBFRM.

1.3 Research problem and study rationale

The need for this study emerged both through the existing gaps in the literature as well as a lack of research on CBFRM and LK in the Malawian, and more broadly, African context. First, although CBDRR approaches have been implemented globally for three decades, a need for more empirical evidence generated through detailed research of real-life experiences of CBDRR is recognised (Allen 2006, Lassa et al. 2018). Similarly, most recently, Van Niekerk et al. (2018) argued for a need to further understand how the theoretical propositions of CBDRR translate into practical outcomes on the ground. In Malawi, despite the prominence of community-based approaches, research to date acknowledges the existence of CBFRM rather than undertaking any detailed exploration

of its setup, experiences and challenges (Lumumba Mijoni and Izadkhah 2009, Nillson et al. 2010, Kita 2017a).

Second, there is a need for building the evidence base for LK in DRR, and by inference FRM, through documentation of it (Santha et al. 2014, Haque 2019), as much of this knowledge remains inaccessible to both knowledge holders as well as external stakeholders (i.e. NGOs, government) working with communities (Dekens 2009). Several authors have raised concerns of LK for DRR being understudied in an African context (Mavhura et al. 2013, Hooli 2016, Iloka 2016, Dube and Munsaka 2018), with previous research on the topic in Malawi being particularly scarce. Since LK became of interest to disaster researchers, there were many studies globally dealing with LK documentation (e.g. Alcántara-Ayala 2004, Nyong et al. 2007, Lunga and Musarurwa 2016, Ngwese et al. 2018), and this thesis will contribute another case-study to the global knowledge on the topic.

Third, a mere focus on documentation of LK is not enough, a fact that has been argued strongly in development studies (Briggs 2005, Briggs et al. 2007, Smith 2011), but rarely acknowledged in disaster literature (Dekens 2007, Hilhorst et al. 2015, Salite 2019a). The problem that arises when our understanding of LK focuses primarily on its content is that LK is then seen as something that can be extracted and decontextualized, whereas in reality, LK cannot be detached from its imminent social, political and economic realities (Briggs 2005, 2013, Klenk et al. 2017). Therefore, what is needed is more understanding of the processes related to LK, including understanding of how is this knowledge created, disseminated, used and perceived (Dekens 2007, Naess 2013, Rahman et al. 2018, Kerr et al. 2018), as this would allow for a more realistic consideration of LK and its agency within DRR. Moreover, a focus on documentation tends to romanticise LK (Briggs 2005), whereas what is needed is a more critical engagement with the concept, since the pace of global change and its influence on LK is significant (Mercer 2012, Hilhorst et al. 2015). Taking into account this change, it is useful to understand the processes behind LK production and use (Tran, Takeuchi, et al. 2009). Therefore, in addition to the documentation of LK for FRM in Malawi, this research will also bring insights on the processes related to the creation of LK, critically explore the use of LK and explore its change over time. Moreover, it will put a special emphasis on understanding the views towards LK, both by local communities as well as external stakeholders involved in CBFRRM.

Fourth, the literature recognises that although LK is becoming increasingly recognised, there are still gaps in understanding how it is being used under the realm of the official approaches to DRR, including CBFRM (Dekens 2007, Ouriachi-Peralta and Fakhruddin 2014, Carby 2015). It is argued that the question of the extent of LK inclusion in development remains open (Smith 2011), despite widely-rehearsed rhetoric that LK presents an inherent component of good development practice. Through exploring LK under the umbrella of CBFRM in Malawi, this thesis will bring insight into how LK interacts with CBFRM, thus offering further empirical evidence.

1.4 Research aim and objectives

Based on identified research problems, this thesis aims *to critically assess the role of LK in CBDRR and identify the barriers and opportunities for its enhanced use*, with a focus on LK and CBFRM in the Lower Shire Valley in Malawi. In order to address this aim, specific research objectives are to:

1. Provide a critical exploration of the existing CBFRM in Malawi (Chapter 4)
2. Identify the current range and extent of LK for CBFRM in Malawi (Chapter 5)
3. Provide further understanding of the process perspective on LK for FRM including the production and dissemination of LK, its use by different CBFRM stakeholders and their attitudes towards it (Chapters 5, 6 and 7)
4. Develop recommendations for the enhanced use of LK in Malawi (Chapters 7 and 8)

1.5 Research approach

1.5.1 Outline of the adopted approach

This thesis adopts a qualitative research approach. The results, discussions and findings are based on the thematic analysis of the empirical data collected through key informant interviews (KII), focus group discussions (FGDs), and direct observations. In addition, secondary data from available documentation were used. The data were collected through three periods of fieldwork in 2016 and 2017, with case study areas in the Lower Shire Valley in Malawi. Research participants were recruited from different stakeholder groups, including local communities in the Lower Shire Valley, members of NGOs and government at the district and national levels, and FRM consultants. The latter three groups are referred to in this research as external stakeholders, as they are not the members of a community where CBFRM projects are implemented.

1.5.2 Interdisciplinary and applied nature of the research project

The field of DRR is inherently interdisciplinary (Van Der Waldt 2009), which is not surprising as disasters are complex problems requiring varied insights to provide a comprehensive understanding. The prominence of interdisciplinary research has grown over the years, as an answer to the complexity of problems experienced by modern societies and rapidly changing environmental and social landscapes (Lyall and Meagher 2012). The presented research project is also interdisciplinary. As defined by Aboelela et al. (2007, p.341) interdisciplinary research is

‘based upon a conceptual model that links or integrates theoretical frameworks from those [different] disciplines, uses study design and methodology that is not limited to any one field, and requires the use of perspectives and skills of the involved disciplines throughout multiple phases of research process.’

Although the analysis presented through this thesis is based on a qualitative approach, commonly used under the realm of social sciences, the interdisciplinary nature of this research stems from two aspects. First, theoretical foundations from various disciplines (e.g. human geography, anthropology, and engineering) and areas of study (e.g. development studies, DRR) were used in order to frame and achieve research objectives. For instance, LK is traditionally explored under a domain of anthropology, whilst CBDRR is often researched by geographers and development scholars. Second, the interdisciplinary nature in this thesis emerges through researchers’ educational background in engineering. Different disciplines understand different training and scientific cultures (Tobi and Kampen 2018), with engineering being a discipline based on the application of practical solutions to given problems. In relation to conducting the present research, this has resulted in the researcher being oriented towards enriching in-depth understanding gained through employing qualitative methodologies to understand the complexity of LK in the real world setting with an approach oriented towards proposing practical solutions.

Furthermore, the present research is an applied research project. In comparison with fundamental social science research, which creates new theoretical insights about how fundamental social processes work, applied research is based on the employment of scientific methodologies in order to develop information for a solution of a specific problem to a society (Bickman and Rog 2009). Since flooding is a serious threat to lives, livelihoods and overall well-being in Malawi, this research was initiated and conducted

with an aspiration to propose insights that would foster the development of evidence-based practical solutions.

1.6 Thesis outline

This thesis is organised into a further eight chapters. **Chapter 2** provides a review of the literature, including the explanation of the key theoretical concepts and exploration of the changing disaster paradigms. It provides a detailed explanation of CBDRR and LK, and it presents previous research on FRM and LK in Malawian context. **Chapter 3** provides a rationale for the employment of a qualitative methodology, details case-study research design and provides a description of the Lower Shire Valley, together with giving an overview of the research methods used. This chapter also provides an account of how the research was implemented in practice, as well as how the collected data were analysed.

The results are then presented in the following chapters (4-7). **Chapter 4** explores current CBFRM in Malawi, thus directly addressing *Objective 1*. By looking through the lens of different stakeholder groups (i.e. government, NGOs and local communities), it identifies challenges in current CBFRM in Malawi. **Chapter 5** provides a detailed documentation of LK used by communities in the Lower Shire Valley, thus directly addressing *Objective 2*, and partly *Objective 3*. It identifies and presents a blueprint of the different dimensions of LK. **Chapter 6** expands on the community ‘side of the story’ regarding LK, and it partly addresses *Objective 3*. It explores what local communities see as the benefits and limitations of LK and identifies changes in LK. It then presents how LK is seen in relation to external knowledge, together with mapping how local and external knowledge are integrated. Finally, Chapter 6 unveils different factors and processes that condition the use of LK. **Chapter 7** explores LK through the views of external stakeholders, thus finalising *Objective 3*. It brings understanding of how LK is used in their approaches, and explores what external stakeholders see as an opportunity for enhancing the role of LK, partly addressing *Objective 4*. **Chapter 8** is a discussion chapter and connects the findings from the empirical chapters (4-7), whilst placing these in the context of the current state of knowledge on the topic. It outlines the obstacles in existing CBFRM for the use of LK and provides a comprehensive set of recommendations for enhancing the role of LK, addressing *Objective 4*. **Chapter 9** summarises the research and outlines the main conclusions. It explicitly outlines the research contributions and discusses study limitations. Finally, it identifies areas for further research.

Chapter 2- Literature review

This chapter offers a review of the relevant literature. Section 2.1 introduces the main concepts within the field of DRR, and Section 2.2 provides an overview of approaches to DRR. Sections 2.3 and 2.4 deal respectively with the core of this thesis: the concepts of CBDRR and LK. Specifically, Section 2.3 engages with the complex notion of community, before proceeding to explore the principles, process and challenges of CBDRR. In Section 2.4 the notion of LK and its position within DRR is unpacked. Section 2.5 presents the context of Malawi.

2.1 Theoretical concepts in disaster research

As noted by Kelman (2018), the field of disaster research is overwhelmed with jargon, with terms and definitions constantly evolving. In order to conceptually ground this thesis, it is important to elaborate on the core concepts and explain the adopted definitions. In the academic literature, there are ‘heated’ debates regarding the definition of some of the concepts, most notably vulnerability and resilience. Some of the adopted definitions and terminologies are briefly described in the following sub-sections.

2.1.1 Disasters and disaster risk

According to the United Nations Office for Disaster Risk Reduction (UNDRR) disasters are defined as:

‘a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts’ (UNDRR 2016, p. 13)

Disasters occur when disaster risks are exposed. Disaster risks are long lasting, continuous and changing processes (Birkmann 2013). Taking into account the qualitative and interpretative nature of this thesis, disaster risk is conceptualised based on the seminal work of Blaikie et al. (1994), later extended in Wisner et al. (2012). According to this school of thought, disaster risk (DR) can be expressed in the form of:

$$[1] \quad DR = H \times [(V/C) - M],$$

where H is *hazard*, V is *vulnerability*, C is *capacity*, and M is *mitigation and prevention*. As described by Wisner et al. (2012), although the equation is in the form of a mathematical equation, it does not represent an equation used for calculation. It is rather,

according to Wisner et al. (2004), a pseudo-equation. Therefore, in this form, it is dimensionless.

Some other commonly found conceptualisations of DR (Wrachien et al. 2011, IPCC 2012, UNDRR 2016) define disaster risk as a product of hazard, vulnerability and *exposure*. According to the latest definitions from UNDRR, exposure is ‘*the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas*’ (UNDRR 2016, p. 18). Although not explicitly stated as a single variable in the DR equation by Wisner et al. (2012), exposure is encompassed under the term of vulnerability, since the authors conceptualise their view of vulnerability to include a susceptibility to harm. Exposure is easier to quantify and represent spatially, because it essentially accounts for the human presence in the environment (e.g. presence of population in a flood prone area, housing stock on a slopes prone to landslides), whereas vulnerability is more challenging to represent as it inherently incorporates social, political and economic processes, as will be elaborated in Section 2.1.1.2.

2.1.1.1 Hazard

For the purposes of this thesis, hazard is defined as:

‘a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.’ (UNDRR 2016, p. 18)

There are different types of hazards, and of different origin. Hazards can be natural, as covered by this thesis (e.g. droughts, floods, landslides, volcanoes), man-made (e.g. conflict and terrorism), environmental, technological and biological (UNDRR 2015).

As briefly introduced in Chapter 1, this thesis is focused on a specific natural hazard: flooding, which is the most frequent and devastating natural hazard (Keating, Campbell, Mechler, et al. 2017, Jongman 2018). Floods are commonly defined as excess water that temporarily covers the land outside its normal confines (Schanze 2006). There are different types of floods, such as fluvial, coastal, pluvial and flash floods. Fluvial floods occur when rivers and streams overflow their banks (Blöschl et al. 2015); coastal floods occur in coastal areas due to, for instance, storm surges (Takagi et al. 2016); pluvial floods can occur in urban areas during the periods of excessive rainfall when receiving drainage systems are overtaxed (Maksimović et al. 2009); and flash floods, which are especially deadly, occur in small and steep catchments where rivers respond quickly (Gaume et al.

2009). In addition to these types of flooding, there are also compound flood events (e.g. coastal and fluvial floods occurring simultaneously in low-lying coastal areas) (Hendry et al. 2019).

2.1.1.2 Vulnerability

According to the UNDRR vulnerability represents:

‘conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards’
(UNDRR 2016, p.24)

There are many different definitions of vulnerability found in the literature². In this thesis, vulnerability is conceptualised based on the premise that vulnerability is caused and maintained by social, political and economic environments, because these determine the structure of one’s life (Wisner et al. 2004). In this view, vulnerabilities at local scales are generated by exogenous processes such as political systems and governance, that might result in unequal distribution of resources within a given society (Gaillard 2010). Ultimately, vulnerability represents the societal conditions that lead to hazard becoming a disaster (Cannon 1994). In other words, if the hazard would interact with a system (e.g. society) that is not vulnerable, there would be no disasters.

Vulnerability varies between different locations and different community groups, is dynamic in time and varies across different scales (individual, household, community, region) (Vogel and O’Brien 2004, Wisner 2016). There are many factors that make a certain individual/group vulnerable. For instance, these include factors such as age (Freeman et al. 2015), gender (Fordham 2011), disability (Twigg et al. 2018), homelessness status (Vickery 2018), sexual orientation and identity (Gaillard et al. 2017, Gorman-Murray et al. 2018), and being a member of an indigenous group (Smith and Rhiney 2016). Furthermore, although vulnerability and poverty cannot be equated, it is largely accepted that poor people are disproportionately affected by natural hazards (Few 2003, Fothergill and Peek 2004). As shown by Hallegatte et al. (2016), poor people are more affected by natural hazards, benefit less from protection against hazards, and are more often found among disaster victims. Poor people are also constrained by land prices, and thus might settle in marginalised zones more exposed to natural hazards (Flores-

² For the overview of different definitions of vulnerability, the reader is directed to the works of, for instance: Weichselgartner (2001), Manyena (2006), O’Brien and O’Keefe (2014), Oulahen et al. (2019)

Fernandez 2011, Hallegatte et al. 2016), which might lack physical infrastructure that would reduce disaster impacts (Scussolini et al. 2016).

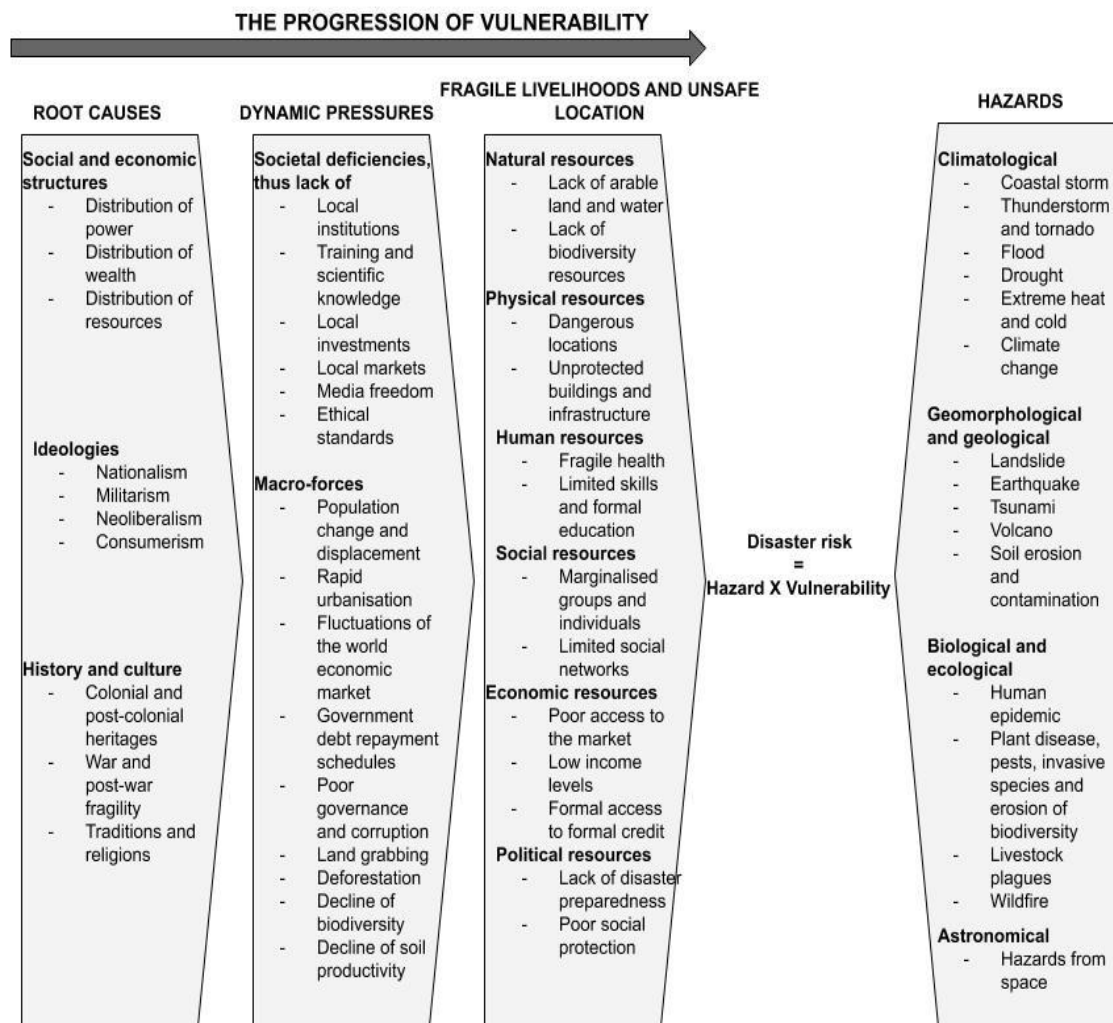


Figure 2.1 The Pressure and Release model (adopted from Wisner et al. 2012, p. 51)

There are several conceptual frameworks on vulnerability³, the most widely cited one being the Pressure and Release (PAR) model, presented in Figure 2.1. The PAR was first presented by Blaikie et al. (1994), with further revisions in Wisner et al. (2004, 2012). The PAR model, in line with the previously discussed disaster risk conceptualisation, conceptualises a disaster at the interface between vulnerability and a hazard. In terms of vulnerability, the PAR model presents a progression of vulnerability, composed of *root causes*, *dynamic pressures* and *fragile livelihoods and unsafe conditions*. The *root causes* relate to processes (e.g. social and economic structures, ideologies, history and culture), that are spatially and temporally distant from local levels, and that dictate how resources

³ Based on the objectives and approach taken in this thesis, the focus on this section is on understanding the PAR framework. For an overview of different frameworks used to assess and conceptualise vulnerability, the reader is encouraged to see (e.g. Birkmann 2013, Moret 2014, Wisner 2016). Furthermore, this section does not engage with literature on index-based approach for quantitative assessments of vulnerability (e.g. Cutter et al. 2003, Birkmann 2007).

are shared among different groups of people (Wisner et al. 2004). For instance, they assume that conditions at local levels are determined by the distribution of wealth and resources within a society. Through *dynamic pressures* (e.g. lack of access to markets, lack of scientific knowledge, deforestation, population growth, urbanisation), which are more immediate representations of underlying social, economic and political processes, root causes are channelled into *unsafe conditions and fragile livelihoods* people live in (e.g. low income levels, lack of disaster preparedness, unsafe construction) (*ibid.*).

The concept of livelihoods is an important part of the PAR framework and understanding of vulnerability. According to Chambers and Conway (1991, p.1) livelihoods ‘*comprises people, their capabilities and their means of living, including food, income and assets*’. Since people in many areas of the world are dependent on their livelihood, faced with no other choice, they decide to live in areas exposed to natural hazards because of the availability of those livelihoods, e.g. living in the flood prone areas due to fertile agricultural land (Cannon 2008). Therefore, the Sustainable Livelihoods Framework (DFID 1999) has found great application in research and practice of natural hazards. The framework identifies five livelihood resources crucial to dealing with shocks, including natural hazards. These are human, social, natural, physical and financial resources; Wisner et al. (2012) also added political resources to this list. Access to livelihood resources is crucial in dealing with disaster impacts, and the approach has been widely discussed (e.g. Twigg 2001, Kelman and Mather 2008, Gaillard 2015, Keating, Campbell, Mechler, et al. 2017). People are made more vulnerable because they lack access to livelihood resources. The importance of the sustainable livelihoods approach is that it links disasters with the overall development process and emphasises a need to reinforce livelihoods as a way to reduce the impacts of natural hazards (Twigg 2001, Cannon et al. 2003), ultimately making people more resilient (Keating, Campbell, Szoenyi, et al. 2017).

2.1.1.3 Capacities, coping and adaptation

Although the focus on vulnerability as a socially, economically and politically conditioned process presented an important paradigm shift in how disasters were conceptualised and managed, the danger of portraying people as vulnerable, implying they are victims and passive agents in need of assistance has become increasingly recognised (Cannon 2000, Heijmans 2004, Fordham 2007). In reality, people have undeniable capacities that help them mitigate, prepare for and deal with external shocks, including natural hazards (Anderson and Woodrow 1989, Twigg 2001, Davis et al. 2004).

Denying people's capacities also means missing an opportunity to build on local knowledge and skills (Wisner 2016). Broadly defined, the concept of capacities refers '*to the set of diverse knowledge, skills and resources people can claim, access and resort to in dealing with hazards and disasters*' (Gaillard et al. 2019, p. 865). Capacities should not be seen as opposite to vulnerability on a single spectrum, because despite being vulnerable, people also might possess a vast array of capacities (Anderson and Woodrow 1989, Wisner et al. 2012, Gaillard et al. 2019).

As conceptualised by Wisner et al. (2012), capacities include an array of different resources, namely human, social, physical, economic, political and natural resources. Individuals and communities draw on these resources in order to prevent, resist and cope with hazards (*ibid*). Figure 2.2 presents what Wisner et al. (2012) coined as the circle of capacities, and shows a vast array of different skills, resources, knowledge and strategies people tap into.

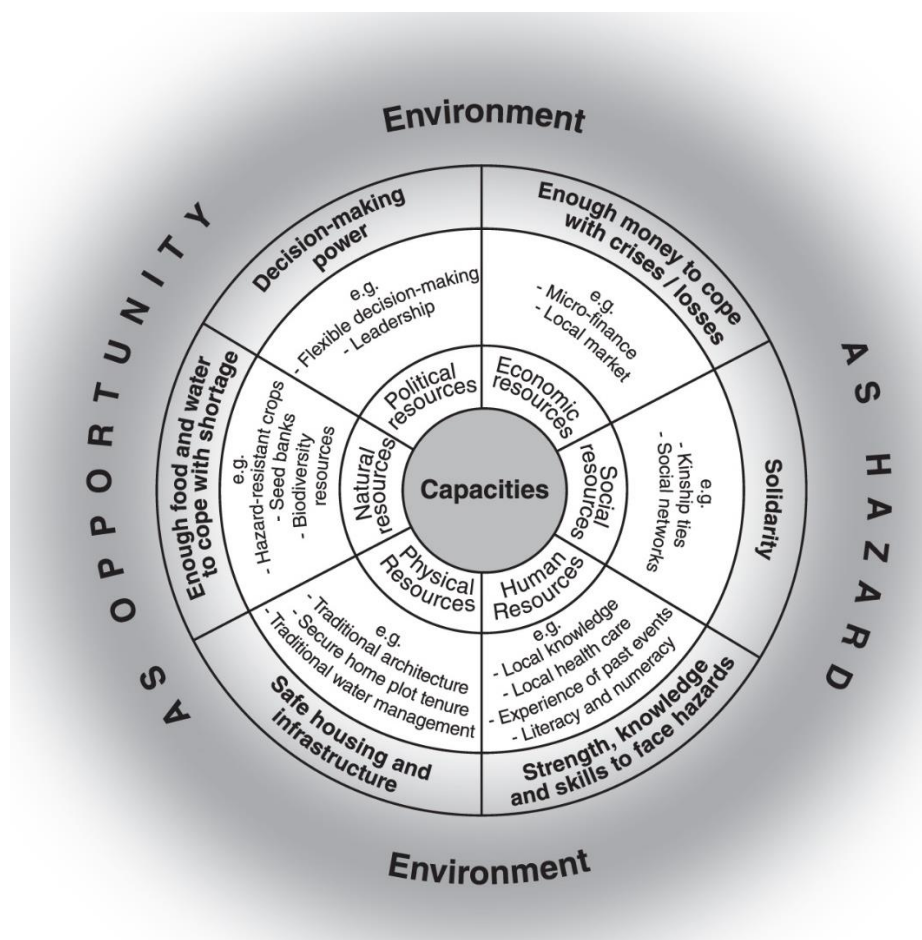


Figure 2.2 Circle of capacities (adopted from Wisner et al. 2012)

Capacities include both coping and adaptive capacity (Gaillard et al. 2019). Coping capacity depicts how capacities are mobilised in times of disaster (Gaillard 2010), and are often a subject of research in disaster studies (e.g. Skoufias 2003, Helgeson et al. 2012). Overall, coping capacity is usually conceptualised as short-term measures employed by individuals and communities in light of extreme events (Wamsler and Brink 2014, Islam et al. 2018). Wisner et al. (2004) presented a range of coping strategies as employed before, during and after an event, and identified the following: preventative strategies, impact-minimising strategies, storing food and saleable assets, diversifying production and income sources, development of social support networks and post-event coping strategies. For instance, Paul and Routray (2010) while researching coping strategies for dealing with floods in Bangladesh, identified strategies that save lives, household items, homes, crops, livestock, fisheries, together with local medicinal practices and changes in eating behaviour.

Another component of capacities is adaptive capacity, increasingly being seen as important in DRR and entering from the climate change adaptation⁴ literature (e.g. Gallopín 2006, Smit and Wandel 2006). Adaptive capacity has a prospective dimension and it implies an ability to adapt to and anticipate change (Cohen et al. 2016, Gaillard et al. 2019). Adaptive capacity is manifested through adaptation (Smit and Wandel 2006), which implies longer-term and fundamental changes beyond reactive responses that require planned and strategic actions and iterative social learning (Wamsler and Brink 2014, Islam et al. 2018, Mabuku et al. 2019). For instance, while researching how people deal with recurring floods in Indonesia, Marfai et al. (2015) found that local people have adapted the way in which they build their houses, by raising the foundations and building houses with more floors.

Gaillard et al. (2019) point out that capacities are largely endogenous to people's localities because they draw on local resources and knowledge, which is different to vulnerability that is, as explained in Section 2.1.1.2 largely created through exogenous processes. However, it is important to recognise that people's access to and ability to employ their capacities is still influenced by larger structural constraints, such as access to institutional resources, social capital and financial institutions (Pelling 1998, Keating, Campbell,

⁴ There is an increased focus in literature on understanding the synergies and differences between approaches taken climate change adaptation and disaster risk reduction. For the overview of the debate, the reader is referred to, e.g. O'Brien et al. 2006, Thomalla et al. 2006, Mercer 2010, Seidler et al. 2018.

Mechler, et al. 2017, Mutaqin 2019). In other words, although people have inherent capacities, they still might be limited in accessing them. Therefore, it is important to approach the concept of capacities with a critical lens, and in the process, not disregard that although possessing capacities, people might still be vulnerable.

2.1.2 Resilience

Since entering the disaster discourse, resilience as a concept has been increasingly used in international policies (UNDRR 2015), and has been shaping donor funded projects in developing countries, focusing on building disaster and community resilience (Ruszczyk 2019). Despite being one of the ‘buzz-words’ in disaster research and practice, there is no universally accepted definition of resilience⁵ (*ibid.*), with definitions often varying according to a specific academic discipline (Kelman et al. 2016). For the purposes of this research, resilience is conceptualised based on the following definition:

‘Resilience emphasises the multiple ways in which system can respond to hazard occurrence, including its ability to absorb hazard impacts, to learn from, adapt to and recover from them, and to reorganise after impacts.’ (López-Marrero and Tschakert 2011, p.230)

This definition was deemed appropriate for the following reasons:

- It incorporates capacities (i.e. coping and adaptive capacity), thus also integrating LK. This recognition implies that people’s capacities not only form a part of their resilience, but also can be enhanced as a part of resilience building activities (Manyena 2006).
- It conceptualises resilience as a ‘bouncing forward’, rather than ‘bouncing back’ concept. Defining resilience in a manner that sees it as going back to pre-disaster situation is criticised (Manyena et al. 2011, Mochizuki et al. 2018), because it implies the maintenance of status-quo, and in that sense, does not recognise the transformative capacity of disasters (Mavhura and Manyena 2018), nor does it account for dynamism of social systems in the face of changing trends, where constant learning appears (Keating, Campbell, Mechler, et al. 2017, Mavhura and Manyena 2018).

There are increasing critiques of resilience. For instance, Mitchell (2013) points out that resilience is shaped as a political agenda, and it lacks clear technical guidance that would

⁵ A comprehensive overview of definitions of resilience in disaster context is extensively covered in e.g. Manyena 2006, Keating, Campbell, Mechler, et al. 2017, Mavhura and Manyena 2018.

facilitate a change in practical implementation on the ground. Therefore, there is a risk that the concept of resilience will be abandoned when a new ‘buzzword’ appears (*ibid.*). The romanticising notion of resilience is critiqued for not engaging with the power structures that keep people vulnerable in the first place, thus not including consideration of processes that are limiting community capacities and generating vulnerabilities (Cannon and Müller-Mahn 2010, Berkes and Ross 2013, Rusczyk 2017). More recently, Mochizuki et al. (2018) critique the framing of resilience as ‘positive’ as problematic, since it lacks clear identification of linkages between resilience and drivers of risk, such as environmental degradation and political marginalisation, that are resilient systems themselves. Furthermore, Rusczyk (2019) argues that, although the resilience agenda aims to improve living conditions at the local level, in the process of delivering interventions on the ground, an explicit focus on individual and communities is lost. Moreover, Weichselgartner and Kelman (2015) argue that existing approaches to resilience are imposing a technical-reductionist framework and favouring decontextualised top-down knowledge, especially in terms of overly simplistic representations of community resilience through index-based and quantitative approaches. Finally, it is argued that it is difficult to deliver resilience within the prevailing neo-liberal agendas in which the responsibilities and risks are transferred to local communities, thus shifting the responsibilities away from those in power (Tierney 2015).

2.2 Disaster risk management approaches

The meaning and ideas surrounding what causes a disaster have changed throughout history, with disasters being seen as Acts of God, Acts of Nature and more recently, Acts of Men and Women (Quarantelli 2000, Furedi 2007). These changes in thinking have resulted in paradigm shifts in academic research (i.e. the hazard and vulnerability paradigm), that have consequently modified the ways in which disaster risks are managed and reduced.

2.2.1 From top-down and hazard-centred, to bottom-up and vulnerability-centred approaches

Generally, the literature distinguishes between two approaches that have shaped academic thinking and practical approach to managing disasters: the hazard paradigm and the vulnerability paradigm (Maskrey 1989, Gaillard and Mercer 2013, Wisner 2016). These have resulted in two distinct approaches to managing disasters: top-down and bottom-up approaches, respectively.

The hazard paradigm dominated the discourse by equating a disaster to a hazard (Frazier 1979), thus depicting it as purely natural. In the hazard paradigm, it is assumed that people have poor perceptions of hazards and risk; thus, leading to misconceptions and inadequate interaction with their surrounding environment (White 1945, Wisner 2016). In this view, since disasters are natural, a primary focus on how to deal with them is through large-scale infrastructural and engineering solutions (e.g. building dikes and sea walls to protect from floods) (Mercer et al. 2008, Coles and Quintero-Angel 2018). This represents a top-down (or often called command-and-control) approach, in which decisions are made centrally, by national-level governments and respective sectoral ministries. It is characterised by reliance on scientific knowledge (SK) (Coles and Quintero-Angel 2018), hence favouring solutions stemming from science and technology (Wisner 2016), with the public only seen as a passive receiver of the information and interventions (Jahangiri et al. 2011). Therefore, there was no room for the participation of the communities at risk (Pearce 2003), and top-down approaches were characterised by a general lack of appreciation of capacities local people have (Sim et al. 2017). Top-down approaches based on the hazard paradigm are heavily criticised. In his seminal work, Maskrey (1989) identified three major issues with hazard-focused and top-down approaches, namely: i) a failure to address vulnerability aspects, ii) a lack of engagement of people at risk, and iii) a proneness to manipulation, since top-down approaches politically favour those in power. Top-down solutions often failed and resulted in inadequate solutions, owing to not being underpinned by an understanding of the underlying vulnerabilities and lack of participation of those at risk (Mercer et al. 2009, Bollin and Hidajat 2013, Coles and Quintero-Angel 2018).

In the 1970s, as a result of a realisation that disasters are more a consequence of socio-economic factors than mere hazard characteristics alone (O’Keefe et al. 1976, Wisner 1978), a vulnerability-paradigm emerged, which was based on understanding that people’s vulnerability to disasters is shaped by interconnected underlying social, economic, political and cultural processes (Blaikie et al. 1994, Wisner et al. 2004), as explained in Section 2.1.1.2. The vulnerability paradigm emphasised the importance of community participation in dealing with disaster risks, which resulted in a rise of bottom-up and more people-centred approaches (Scolobig et al. 2015). In bottom-up approaches, residents are seen to have a greater responsibility for managing their disaster risks, as opposed to top-down approaches, where the responsibility is solely on the government (*ibid.*). Some of the most prominent bottom-up approaches are community-based

approaches, which are one of the central enquiries of this thesis, and will be elaborated in detail in Section 2.3. These approaches rely on a premise that involvement of the local communities is key at all stages, recognising communities as a resource with abundant LK, skills and capacities that can be used to effectively mitigate risks and impacts of hazardous events (Dekens 2007, Dumaru 2010, Gaillard and Mercer 2013).

It is important to emphasise that no single approach is a panacea, because no single model is appropriate for all context and hazard circumstances, and there is a need for a fine balance between top-down and bottom-up approaches (Scolobig et al. 2015). For instance, response to extreme events such as large floods might be outside of the realm of community capacities, and a top-down intervention (e.g. by employing military forces) might be required (Gaillard and Mercer 2013). On the other hand, dealing with smaller events, such as recurring flooding can foster and build on the existing capacities found in the communities (Gaillard et al. 2019).

Emphasising the importance of integrating top-down and bottom-up approaches, together with integrating different types of knowledge, Gaillard and Mercer (2013) developed a framework for integrated disaster risk reduction (Figure 2.3). Essentially, this conceptualisation stresses that disasters can be dealt with in a sustainable manner only through a coherent approach in which top-down actions tackle the underlying and structural sources of vulnerability (e.g. poverty, poor governance), while bottom-up approaches enhance peoples capacities (Gaillard and Mercer 2013).

Although contemporary thinking sees bottom-up actions as an imperative for delivering benefits at local levels, these often stay mere narratives, whilst top-down approaches still dominate (Gaillard and Mercer 2013). One of the possible explanations for this is that it is easier for decision-makers to rely on technical solutions and showcase fast results than to engage with the structural factors making communities vulnerable in the first place (Mercer et al. 2008). The failure to meaningfully involve people in decision-making through bottom-up approaches results in insufficient vulnerability reduction, and by inference, inadequate reduction of disaster risks (Weichselgartner and Obersteiner 2002).

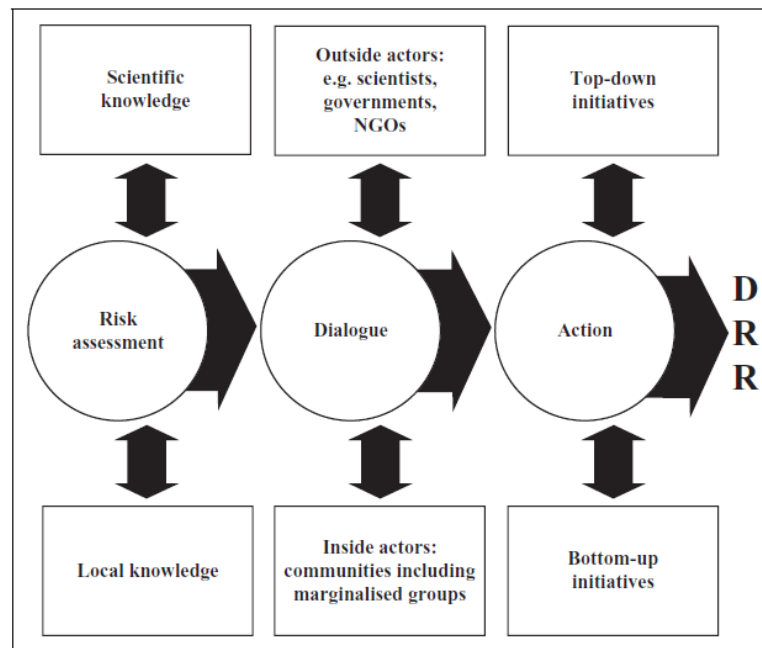


Figure 2.3 Integrated disaster risk reduction framework (adoped from Wisner et al. 2012)

2.2.2 From managing disasters to managing disaster risks

When it comes to managing disasters and disaster risks, three approaches are often referred to: i) disaster management (DM), ii) disaster risk management (DRM), and iii) disaster risk reduction (DRR) (definitions in Table 2.1).

Table 2.1 Definitions of disaster management, disaster risk management and disaster risk reduction

| Term | Definition |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disaster management | The organisation, planning and application of measures preparing for, responding to and recovering from disasters. (UNDRR 2016, p.14) |
| Disaster risk management | Application of disaster risk reduction policies and strategies to prevent new risk, reduce existing disaster risk and manage residual risk, contributing to strengthening of resilience and reduction of disaster losses. (UNDRR 2016, p.15) |
| Disaster risk reduction | Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore the achievement of sustainable development (UNDRR 2016, p. 16) |

The evolution and application of these approaches mirrors the shifts in thinking from hazards towards vulnerability, and from top-down approaches towards appreciating bottom-up actions (Paul et al. 2018). For instance, it is often emphasised that DM focused more on responding to and recovering from disasters (Jones et al. 2015), whereas DRM and DRR take a more comprehensive approach and also include elements of prevention, mitigation and preparedness (Ouriachi-Peralta and Fakhruddin 2014). Overall, it can be argued that DRM and DRR, in comparison to DM, incorporate more ‘risk thinking’, since these approaches make a shift from mere response towards incorporating notions of not

only managing and reducing existing risks, but also avoiding the creation of new risks. These newer approaches also make a strong reference to the inextricable link between risk management and overall development processes (Wamsler 2010, Arnold 2012) and see risk management as a developmental tool (World Bank 2013).

An approach to managing and reducing disaster risk is often represented in the form of the disaster cycle, presented in Figure 2.4. The cycle is composed of four components:

1. Mitigation encompasses strategies and practices aimed at reducing the very likelihood or consequence of a hazard, e.g. levees, land-zoning, building practices (Coppola 2011);
2. Preparation/preparedness refers to strategies and measures for preparing for and reducing the impacts of disasters, e.g. early warning information, contingency planning, evacuation drills (Buckle 2012);
3. Response encompasses strategies to reduce negative disaster impacts and avoid further possible implications, e.g. evacuation of people and property (WMO/EHA 2002);
4. Recovery involves aspects such as relief, reconstruction and rehabilitation (Wisner et al. 2012); usually it refers to ‘normalising’ and returning to the pre-disaster situation (Coppola 2011), although contemporary thinking encourages the concept of ‘building back better’ (UNDRR 2015).

Although its prominence still prevails, especially in practice, the cycle is not without critiques. For instance, Twigg (2015) argues that this representation is too simplistic, and it does not capture the complexity of disasters. In reality, these phases will never be so distinct and compartmentalised (*ibid.*); they are rather in a constant interplay and continuum (Coppola 2011). Weichselgartner and Obersteiner (2002, p.74) even called it as a paradigm that ‘*encourages false assumptions about appropriate response to disasters*’, since it fails to represent how local people perceive ways to manage risks, which is in a more integrated and continuous manner.

Often, measures for delivering DRR are classified as structural and non-structural. As explained by the latest disaster terminology (UNDRR 2016), structural measures refer to engineering approaches resulting in physical infrastructure (e.g. construction practices), whilst non-structural measures refer to strategies involving policies, laws and ‘soft

approaches’ (e.g. training, education, awareness-raising). Whereas structural measures are more tailored towards hazard reduction, non-structural measures aim to decrease vulnerability and exposure (Harries and Penning-Rowse 2011). An overview of different structural and non-structural measures available to manage and reduce flood risks are presented in Figure 2.5.

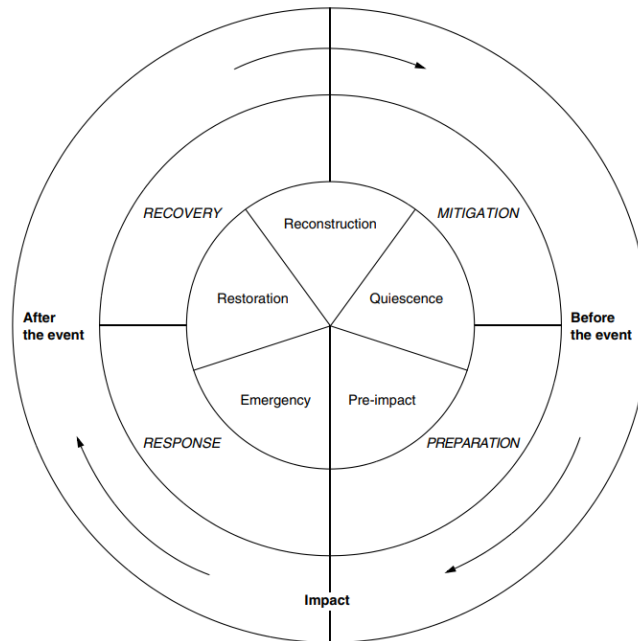


Figure 2.4 The disaster cycle (adopted from Alexander 2002, p. 6)

2.3 Community-based disaster risk reduction (CBDRR)

While throughout the Section 2.2 an overview was given of different approaches to deal with disaster risks, this section will focus on one of the central features of the present research: CBDRR. This will include understanding the complex notion of a ‘community’ and key concepts behind CBDRR, as well as its critical assessment.

2.3.1 Defining ‘community’

There is increasing criticism that the term ‘community’ is used uncritically by practitioners, policy-makers and donors involved in DRR (Pelling 2007, Titz et al. 2018). This section therefore begins with a critical review of the meaning and conceptualisation of the term ‘community’. Community means different things in different disciplines. For instance, geographers define communities based on spatial aspects, whereas sociologists emphasise dimensions of social interactions and networks (Kumar 2005).

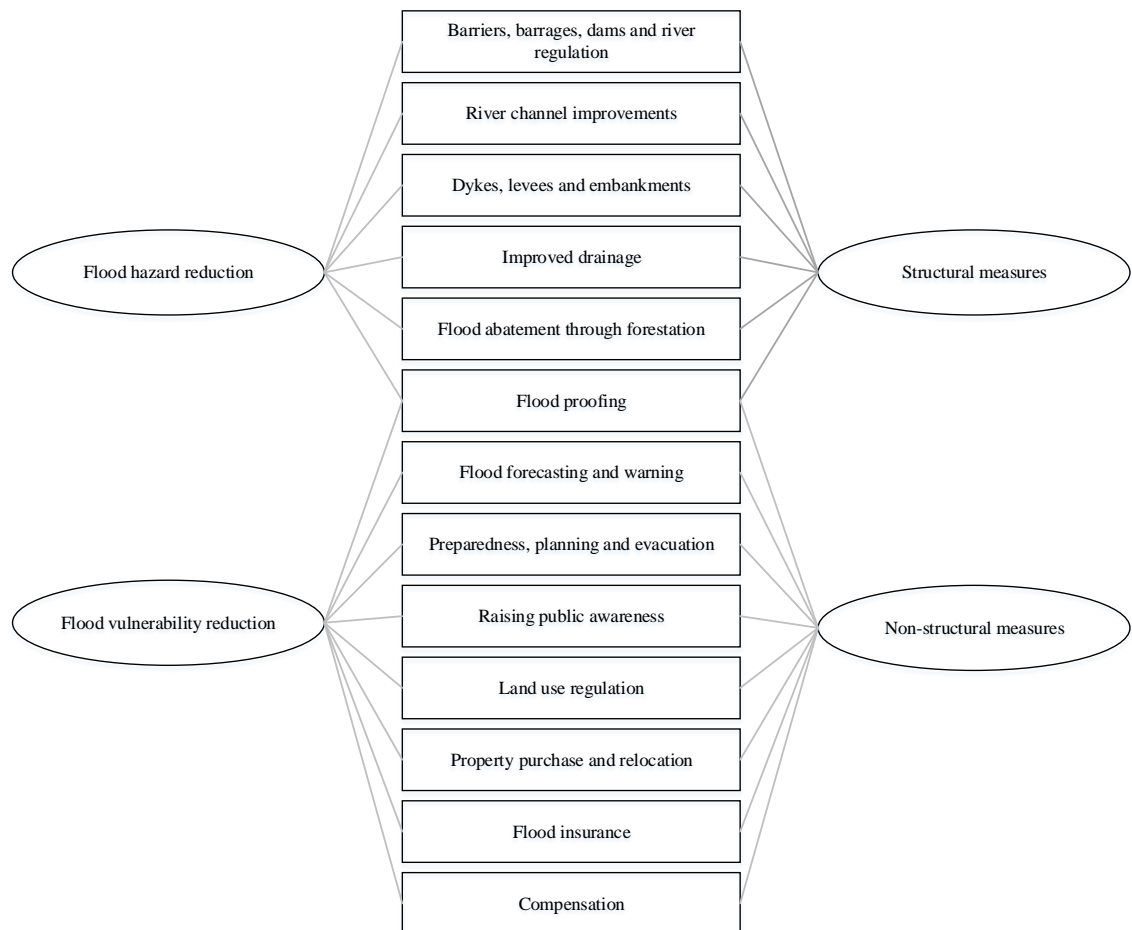


Figure 2.5 Structural and non-structural measures for managing flood risk (adopted from Harries and Penning-Rowsell 2011, citing Parker 2007)

Since exposure to hazards is connected to a physical location, any conceptualisation of a community in disaster research needs to include this spatial dimension. The importance of the spatial dimension of community in DRR has been emphasised by many authors (Allen 2006, Twigg 2009, Oxley 2013, Van Niekerk et al. 2018), especially in rural settings (Marsh and Buckle 2001). For instance, Victoria (2003) conceptualised community as being a group of individuals and households that are residing in the same location that is exposed to a certain hazard (e.g. flood). Therefore, these individuals and households will have shared goals for reducing the disaster impacts (*ibid.*).

However, only underlining the spatial dimension of a community is misleading, since it ignores social dynamics and the heterogeneity of the concept (Titz et al. 2018). As explained by Twigg (2009), the spatial dimension is essential for understanding how hazard propagates in space; however, one must also understand vulnerability aspects of the community. In other words, it is equally important to comprehend the differentiated vulnerability of groups within a community and where the vulnerability arises from (*ibid.*). People living within the same spatial area have different vulnerabilities and

capacities (Abarquez and Murshed 2004). While some will be in a better position to deal with adversity, because of factors such as age, gender, and access to resources, other will be more vulnerable due to those same factors (Marsh and Buckle 2001). Communities are inherently socially heterogeneous and contain different structures of power; where those with more power are in a better position to determine the direction in which community development will go (Pelling 2007). Among other diversifying features, communities consist of people with varying wealth, ethnicity, religion, caste, socio-economic means, and land ownership (Twigg 2009, Bowman and White 2012, Delica-Willison and Gaillard 2012, Ferdinand et al. 2012).

In addition to space, communities can be seen through a lens of a sense of belonging and commitment, common interests, values, attitudes and social structures (Marsh and Buckle 2001, Twigg 2009). People can be members of several communities simultaneously, e.g. based on location and religion (Twigg 2009). Communities are also very dynamic, since individuals having shared goals can join in a common effort and then separate (Twigg 2015).

It is obvious that arriving at a unique definition of ‘community’ is therefore challenging, due to the permeability of boundaries (Heijmans 2009); yet, the term frequently appears across the DRR literature. In DRR-related work, it is crucial to consider both territorial (i.e. spatial) and societal (i.e. diversifying features) points of view (WMO 2017). At the moment, practical and research practice often overlooks the societal features (i.e. community heterogeneity), which can lead to inadequate approaches which do not challenge the root components of vulnerability (Titz et al. 2018). It is of utmost importance to take into account the following: that there is no single and unified community (Marsh and Buckle 2001), and the notion of community is inherently complex.

2.3.2 Defining community-based disaster risk reduction

Table 2.2 gives a brief overview of definitions of CBDRR. Although slight differences can be observed, in general local communities are in the centre of risk reduction and management activities, and they are meaningfully involved throughout the process. This includes planning of activities for local disaster risk reduction, assessments of hazards, vulnerabilities, capacities and risks, implementation, monitoring and evaluation of risk reduction interventions (Abarquez and Murshed 2004, Dumarú 2010, Pandey 2018). In

other words, through CBDRR, communities take part in both evaluating their risks and designing ways to reduce them (Gaillard and Mercer 2013).

Table 2.2. Some definitions of community-based disaster risk reduction

| Source | Definition |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Asian Disaster Preparedness Centre (Abarquez and Murshed 2004, p.9) | A process of disaster risk management in which at risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities. This means that the people are at the heart of decision making and implementation of disaster risk management activities. The involvement of the most vulnerable is paramount and the support of the least vulnerable is necessary. |
| United Nations Office for Disaster Risk Reduction (UNDRR 2016, p.16) | Community-based disaster risk management promotes the involvement of potentially affected communities in disaster risk management at the local level. This includes community assessments of hazards, vulnerabilities and capacities, and their involvement in planning, implementation, monitoring and evaluation of local action for disaster risk reduction. |
| Van Nierkek et al. (2018, p.413) | Community-based disaster risk reduction can be defined as inclusive, active and owned community driven process aimed at addressing the drivers of disaster risk creation; disaster risk reduction; and societal resilience building within the context of local and indigenous knowledge and wisdom. |

In addition to CBDRR, there is a plethora of terms used, such as community-based disaster risk management (CBDRM) and community-based disaster management (CBDM). This thesis uses the term CBDRR as the most popularly used during the time of writing. CBDRR emerged in the 1980s and 1990s (Delica-Willison and Gaillard 2012), driven primarily by civil society and then taken-up by international organisations (Shaw 2016). Up until today, international and national non-governmental organisations (NGOs) working in developing countries continue to be the main implementers of CBDRR. As noted in Section 2.2.1, the concept is strongly rooted in a view that sees disasters as a consequence of social factors (i.e. the vulnerability paradigm) (Allen 2003, Wisner 2016).

2.3.3 Key concepts behind community-based disaster risk reduction

According to Delica-Wilson and Gaillard (2012), the blocks upon which CBDRR is built are people's participation and empowerment, development-oriented activities and a multi-stakeholder approach. Therefore, there will be further elaborated in the following sub-sections.

2.3.3.1 People's participation and empowerment

Participation is a central concept in CBDRR (Dumaru 2010, Klein et al. 2019), since communities are seen as a local resource (Van Niekerk and Coetzee 2012). It is also a concept that has been recognised in global policy arenas, from the Yokohama Strategy and Plan For Action for a Safer World (IDNDR 1994), through the Hyogo Framework for Action 2005-2015 (UNDRR 2005), to the current global policy for DRR- the Sendai Framework for Disaster Risk Reduction 2015-2030 (UNDRR 2015).

The underlying rationale for community participation is simple. First, people at risk have the most to lose when disaster strikes, but also the most to benefit from risk reduction activities (Shaw 2006, Jahangiri et al. 2011); hence, DRR is fundamentally a local affair (Maskrey 2011). Second, people possess rich LK and have various capacities, and through living in the hazard-prone areas have developed a culture of coping and risk reduction (Shaw 2006), which makes them experts at solving localised problems. Third, local people are first responders to disasters, and they organise themselves before the arrival of external assistance (Ferdinand et al. 2012). People's self-reliance is especially evident in developing countries, where governments might lack the capacity to provide assistance (Twigg 1999). Therefore, CBDRR acknowledges and builds upon people's pre-existing capacities, knowledge and local institutions (Heijmans 2009).

Furthermore, CBDRR recognises local people as active and capable agents (i.e., the role of human agency), rather than passive recipients of external interventions, as was the case with top-down approaches (Allen 2003, Delica-Willison and Gaillard 2012). CBDRR enables people to express their concerns through a dialogue (Mercer et al. 2008, Wisner 2016), and approaches problem formulation as well as solution design and implementation from the perspectives of those affected by disasters (Van Niekerk et al. 2018).

In essence, CBDRR approaches aim to decrease the vulnerability and increase the resilience of local communities (Gero et al. 2011), by enhancing skills, coping and adaptive capacities (Allen 2006, Delica-Willison and Gaillard 2012, Van Niekerk et al. 2018). In theory, it also recognises that different people in communities have varied vulnerabilities and capacities (Abarquez and Murshed 2004). Therefore, by enhancing skills and capacities and decreasing vulnerabilities, empowerment is envisioned as an outcome of participation through CBDRR (Pandey and Okazani n.d.). This should also

result in strengthening people's capacity to respond to uncertain climatic and environmental pressures (Allen 2006), an important aspect in a time of increasing uncertainties brought about by global change. Importantly, although CBDRR aims to involve the community at large, it places specific emphasis to the marginalised and most vulnerable community groups (Shaw 2012a).

2.3.3.2 *Development-oriented activities*

CBDRR is deeply and inherently linked with the development context (Dumaru 2010). The vulnerability paradigm recognises the role of inadequate development paths in contributing to creating disaster risks (Pelling 2007, Heijmans 2009); therefore CBDRR has at its core the objective of addressing the root causes of vulnerability, e.g. poverty, poor governance, and marginalisation (Abarquez and Murshed 2004, Shaw 2012a). Hence, it is designed to take a holistic approach and look at DRR as a part of overall development at a local level, where communities' livelihoods are strengthened and their overall living conditions and well-being are improved, which reduces their vulnerability to disasters (Delica-Wilson and Gaillard, 2012). For instance, a CBDRR project implemented in Niger⁶ did not focus exclusively on the standard flood risk reduction activities (e.g. early warning systems, building of infrastructure), but has rather taken a more integrated approach and also included agro-forestry, provision of small livestock and improved seed, all with a rationale of creating improved living conditions. In CBDRR, it is recognised that people in developing countries are exposed to chronic risks, and their main concerns are embedded in daily lives and livelihoods, hence hazards might not be their main priority (van Aalst et al. 2008). Therefore, DRR cannot be a separate approach but should rather be mainstreamed into the overall socio-economic development of people (Maskrey 1989), where local people should be the ones choosing their development paths (Van Niekerk and Coetzee 2012). It is also important to note that funding for many CBDRR projects comes as part of the overall development project funding (*ibid.*).

2.3.3.3 *Multi-stakeholder approach*

Although communities are the core actors in CBDRR, it is envisioned as a multi-stakeholder approach, relying on collaboration and partnership between different stakeholder groups (Allen 2006, Maskrey 2011, Ferdinand et al. 2012). Abarquez and Murshed (2004) provided a useful classification of CBDRR stakeholders into two main

⁶ https://ec.europa.eu/budget/euprojects/community-based-disaster-risk-reduction-niger_en

categories: internal and external. While internal stakeholders are vulnerable populations themselves and community-based organisations, external stakeholders include government (local and national), (I)NGOs, private sector and knowledge institutions (*ibid.*). Similar classifications of stakeholders were provided by Shaw et al. (2012) and Van Niekerk et al. (2018).

Although involvement of communities is a cornerstone of CBDRR, it is recognised in the literature that one must caution against romanticisation and understand there are limits to what people can do themselves. Often, local people do not have enough power to influence decision-making agendas nor the distribution of resources, meaning that they have limited capacity to influence and tackle underlying vulnerability drivers (Maskrey 2011, Oven et al. 2017). Moreover, in some of its components, CBDRR needs technical expertise, skills and knowledge that might not be found within local communities (Delica-Willison and Gaillard 2012, Mercer 2012, Thi My Thi et al. 2012). For instance, people might need assistance with establishing a community-based early warning system, or technical expertise that will assist with optimal positioning of a dyke. Hence, NGOs and governments play a significant role in various aspects of CBDRR; they are central to facilitating the process (i.e. making sure that local needs and priorities are conveyed) and providing technical, material, financial and political support (Abarquez and Murshed 2004, Twigg 2015).

International, national, and local NGOs are one of the main driving forces for CBDRR and are well-placed in implementing DRR at community levels (Benson et al. 2001), since they are rooted in local communities and are aware of the risks these are exposed to (Shaw 2016). Very often, CBDRR is an initiative led by NGOs, and they act as the main facilitators (Shaw 2012a, Thi My Thi et al. 2012). According to Izumi and Shaw (2012), NGOs bring value to CBDRR, through: i) provision of skills and technical expertise, ii) impartiality, iii) advocacy, iv) capacity development of both communities and government, and v) translation of knowledge to the field. There is also a general preference from donors to channel their funding through NGOs (Benson et al. 2001), which might partly explain why CBDRR is predominantly implemented by these organisations. However, in order to ensure the sustainability of CBDRR projects, it is of utmost importance to implement them jointly with the government.

Therefore, local governments play an important role in DRR, especially in countries where the administration and provision of government services is decentralised (Maskrey 2011, Ishiwatari 2012). Aside from providing technical expertise that can enhance the capacities of communities (Izumi and Shaw 2012) and provision of supervision in CBDRR projects (Thi My Thi et al. 2012), local government⁷ is also well-placed to integrate DRR concerns in overall development planning. As such, it is central to the sustainability of CBDRR outside of the project timeframes of NGOs. Another important factor for the sustainability of the project is institutionalisation and inclusion of CBDRR in policies, in which national governments play a central role (Shaw 2006, 2012a), since this level of government administration is often in charge of policy creation. Furthermore, it is important that policies across different spatial levels (i.e. local, regional to national) are integrated (Mercer et al. 2008), ensuring a link between top-down strategies and bottom-up practices (Mercer 2010) and assisting in the upscaling of good-practice CBDRR.

2.3.4 The process of delivering community-based disaster risk reduction in practice

Realisation of CBDRR from the conceptual perspectives explained in previous sections to practical implementation involves employing a process consisting of several steps. Although there is criticism that CBDRR means a different thing for various implementing organisations (Davis and Murshed 2006) since they attach different meanings to it, resulting in different types of activities implemented (e.g. from technical solutions such as small-scale dikes to more local governance-oriented projects) (Heijmans 2009), the process employed is based on similar steps.

For the purpose of this thesis, the CBDRR process presented in Figure 2.6, and first proposed by Abarquez and Murshed (2004), will be used to illustrate the approach. This approach is presented as an almost identical approach has been used to describe CBDRR in different contexts (e.g. Davis and Murshed 2006, UNDP Pakistan 2007, Myanmar Red Cross Society 2013, Van Niekerk et al. 2018, Lassa et al. 2018).

The selection of communities to benefit from CBDRR intervention is usually done by considering factors such as high exposure, vulnerability, accessibility of the community and their readiness to be involved (Abarquez and Murshed 2004, Van Niekerk et al.

⁷ Local government is defined as *state administration at a level closest to the population within its area of jurisdiction*. (O'Brien et al. 2012; p.629)

2018). Once a community is selected, there is a need to build rapport. This is deemed important, since in order to get buy-in from local people, ensure their participation and implement projects that are sustainable, there is a need to overcome the insider-outsider dichotomy and create mutual trust. If people are to express their real needs in an open and non-discriminatory manner, rapport building is a crucial step. In this step, outsiders are also ought to gain a comprehensive understanding of the community, by understanding spatial, socio-economic and cultural characteristics and identifying particularly vulnerable groups and individuals within a community (Abarquez and Murshed 2004).



Figure 2.6 The seven steps process of CBDRR (modified after Abarquez and Murshed, 2004)

Participatory Disaster Risk Assessment (PDRA) and Participatory Disaster Risk Management Planning (PDRMP) are at the core of CBDRR, and differentiate it from top-down approaches. PDRA and PDRMP are based on participatory methods that create a platform for understanding local hazards, vulnerabilities, capacities, risks, knowledge, and desired course of DRR action (McCall and Peters-Guarin 2012). In PDRA, people identify and spatially locate their hazards, rank them according to their perceived severity, describe their vulnerabilities and capacities and produce risk maps (Abarquez and Murshed 2004, McCallum et al. 2016). One of the main components of this process is Participatory Vulnerability and Capacity Assessment (PVCA), proposed by Anderson

and Woodrow (1989). Based on the results of PDRA, the CBDRR will continue to PDRMP, where local communities will identify risk reduction measures and resource requirements resulting in a local DRR plan (Abarquez and Murshed 2004).

Participatory methods are central to the agenda of pro-poor development (Mayoux and Chambers 2005), and have been gaining prominence since the 1970s. There is a plethora of participatory approaches, commonly grouped under categorisations such as Rapid Rural Appraisals (RRAs), Participatory Rural Appraisals (PRAs), Participatory Action Research (PAR), and Participatory Learning and Action (PLA) e.g. (Chambers 1994, 2007, Van Niekerk and Annandale 2013). Although there are differences between these approaches, they are underpinned by similar principles. In summarising some of the previous experiences and applying it to the field of DRR, Mercer et al. (2008) describe participatory approaches as

‘a bundle of research techniques placing emphasis on participants producing detailed accounts of a certain topic using their own words and frameworks of understanding. They arose [...] through promotion of participation and an involvement of local people [...] In brief, they are interactive and collaborative, providing a meaningful research experience that both promotes learning and generates research data through a process of guided discovery.’ (Mercer et al. 2008, p.173)

Participatory approaches take into account LK and are seen as a cornerstone of successful DRR at local levels (Kienberger 2013). They are based on the principle that local people should be included in making decisions that concern their lives and livelihoods. These approaches include (but are not limited to) techniques such as transect walks, group discussions, historical and seasonal timelines, key informant interviews, participatory mapping, matrix scoring and ranking, participatory GIS, wealth ranking and livelihood analysis. A detailed overview of participatory methods for application in DRR is provided by the ProVention Consortium⁸.

Participatory approaches aim to facilitate community participation. The very concept of community participation has a long literature, and it is often represented as anything that involves the people (Cornwall 2008). However, in reality, there are significant differences in levels of participation, whether it is a mere, one-way information eliciting from local people, or rather a transformative process in which local people determine the

⁸ <http://www.proventionconsortium.net/>

research/project agendas (McCall and Peters-Guarin 2012). In addition to the extent/level of participation, it is also important to consider ‘who’ participates, i.e. whether the heterogeneity of community is accounted for (White 1996).

As Abarquez and Murshed (2004) further proposed, after risks and plans have been established, a further process involves the establishment of a new, or strengthening of an existing community-based DRM organisation, community-managed implementation of required activities and participatory monitoring and evaluation. These parts will also require training and capacity building of community members involved (Davis and Murshed 2006). During community-managed implementation, members of the local committees divide tasks, mobilise local resources, monitor the implementation, and facilitate periodic reviews with stakeholders where targets are adjusted (Abarquez and Murshed 2004).

2.3.5 Benefits and challenges of community-based disaster risk reduction

2.3.5.1 Benefits of community-based disaster risk reduction approaches

The literature recognises many benefits of CBDRR approaches. Theoretically, since they emerge from local needs, both problems and solutions are framed accurately (Twigg 2015, WHO 2015). By including the most vulnerable segments of society and being rooted in development, CBDRR reveals and raises awareness of the underlying causes of vulnerability (Allen 2006, Maskrey 2011). Furthermore, being based on local realities, CBDRR should lead to practical solutions that are culturally, socially and economically acceptable (Anderson and Woodrow 1989, Gaillard and Mercer 2013), which should also lead to enhanced ownership of the projects and their sustainability (Maskrey 1989, Gero et al. 2011).

Moreover, since CBDRR relies on local knowledge, skills and resources, interventions implemented are cost-effective compared to top-down and technical approaches that fail to build upon locally available resources (Maskrey 2011). Moreover, through involving local people, CBDRR helps in raising general awareness of risks and community consciousness (Heijmans 2009, Allen 2006, Twigg 1999). By making local people central to the process, CBDRR builds community self-reliance (Allen 2006, Dumarú 2010) and builds community confidence for undertaking risk reduction activities (Shaw 2012b).

In addition to the benefits listed above, others have pointed out that CBDRR, through a multi-stakeholder approach, exposes communities to additional resources and knowledge (Dumaru 2010, Delica-Wilson and Gaillard 2012), and opens up a space for the interaction of different knowledge types (Lassa et al. 2018), an aspect that will be explored through this work. An interesting observation by Pelling (2007) (citing Vermeneulen, 2005) is that CBDRR also brings those in power (i.e. decision makers) closer to local people, thus making them more accountable.

Through its inclusive approach, it seems that CBDRR overcomes many of the shortfalls of top-down driven approaches. However, as argued by Maskrey (2011), while revisiting the practical experiences of CBDRR, the reality of implementation on the ground often has little to do with the underlying ideas shaping the approach. Therefore, a comprehensive criticism of CBDRR will be presented in the following sub-section.

2.3.5.2 Challenges of community-based disaster risk reduction

First, there are concerns that CBDRR fails to deliver its promise to tackle the root causes of vulnerability. Maskrey (2011) and Bowman and White (2012) point out that CBDRR is often focused on the ‘lighter’ and technical aspects of dealing with risks at community level, such as increasing community preparedness and bettering the response. However, these do not tackle the drivers of disaster risk creation and the root causes of vulnerability (Maskrey 2011). The root causes of vulnerability (e.g. resource allocation, discriminatory policies, marginalisation) are dictated by processes that are often external to local communities; hence the mere empowerment of local people envisioned by CBDRR is limited in influencing these processes (van Aalst et al. 2008). In some instances, CBDRR can even be an added burden, by placing greater responsibility on local people (Allen 2006), whilst they have no power to influence policies and processes that turn hazards into disasters (Ferdinand et al. 2012). Similar concerns were raised by other authors (Heijmans 2009, Dumaru 2010, Forsyth 2013).

Second, literature questiones how truly participatory CBDRR is. Since participation is easier to promote than to implement (Delica-Wilson and Gaillard 2012), CBDRR is often done at community level rather than with communities (Maskrey 2011). In a similar manner, CBDRR is often community-based (i.e. spatially) rather than community-managed (Twigg 2015). Furthermore, it is challenged whether CBDRR really pays attention to ‘*who*’ participates; in other words, there is scepticism regarding whether

existing power relations and diversity in the communities are challenged in the participatory process or whether the approach favours certain community groups (e.g. local elites or the most vulnerable) (Pelling 2007, Mercer et al. 2008, Delica-Willison and Gaillard 2012). Heijmans (2009) argued that mainly, participation in CBDRR is nominal and extractive, thus not addressing power relations.

Third, there is no universal approach to what CBDRR is. Heijmans (2009), while framing CBDRR as a political process, argues that ultimately, CBDRR is not based on people's real needs, but rather shaped by differing worldviews and sets of values by different organising parties. In connection to this, other authors pointed out that CBDRR is mainly initiated by outsiders (e.g. NGOs) rather than local communities themselves (Pelling 2007, Mercer et al. 2008). As a result, there is criticism that CBDRR does not reflect local needs, and is hence, still in line with top-down approaches, where it is externally decided what are the topics of interest at local levels (Heijmans 2009, Van Niekerk et al. 2018). As argued by van Aalst et al. (2008), there is also a mismatch between what hazards are of interest for outsiders and their funders (often focused on natural hazards), whilst for local people the priority hazards are those everyday struggles (e.g. food insecurity, inadequate sanitation, security issues).

Fourth, one of the most common challenges of CBDRR is the sustainability of implemented interventions. Many CBDRR interventions are short-lived, and the process ends once when the implementing organisation leaves the field (Maskrey 2011, Delica-Willison and Gaillard 2012, Shaw 2016). This is due to a lack of partnerships between communities, NGOs and government (Shaw 2014), and lack of community ownership due to overreliance on external facilitation (Delica-Willison and Gaillard 2012, Shaw 2012b). Furthermore, many authors point out that this lack of sustainability is connected with a general lack of integration of CBDRR at policy levels, including both local and national policies (Shaw 2012b, Tanwattana 2018). Maskrey (2011) explained that sustainability is hindered by a lack of solid organisational and institutional frameworks.

There are several other challenges identified in the literature. For instance, taking into account their local character, it was argued that scaling-up and dissemination of good practice CBDRR is a difficult task (Shaw 2006, Lassa et al. 2018). Funding remains a problem, due to a reliance on external and short-term funding (e.g. donor funding to NGOs), with limited contributions from governments (Delica-Willison and Gaillard

2012, Van Niekerk and Coetzee 2012). Moreover, donors are often unwilling to channel funding to communities and local governments, whereby they would decide their risk reduction pathways (O'Brien et al. 2012).

Although CBDRR became a mainstream practice, the challenges and criticism of CBDRR implementation presented above indicate the complexity of its practical realisation. Recently, while taking a stock of CBDRR implementation, Van Nierkek et al. (2018) identified a number of research gaps requiring further enquiry. Among others, they point out a need for identifying the linkages between theory of CBDRR and its practical implementation. This thesis will contribute to this gap by understanding the realities of a hazard-specific CBDRR approach (i.e. community-based flood risk management – CBFMR) in the context of Malawi. Through this, it will also answer to calls for a need to describe real-world experiences of CBDRR in practice (Allen 2006, Lassa et al. 2018) as this understanding remains limited at the moment. Emphasis will be put on LK, as it presents one of the cornerstones of the approach (Heijmans 2012).

2.4 Local knowledge

LK started gaining increased recognition both in research and practice in the late 1970s and throughout the 1980s, initiated by the emergence of participatory development (Smith 2011). The changes in the approaches to DRR, explained in Section 2.2, and consequent emergence of CBDRR, are just one manifestation of the rise of participatory development. Like CBDRR, participatory development emerged as an answer to the failure of top-down and technologically driven development, and promoted the inclusion of local people as core actors in deciding for and undertaking their development (Agrawal 1995, Smith 2011, Jacobi et al. 2017). Consequently, this meant recognising the role of LK, which was, prior to this, predominantly an intellectual pursuit of anthropologists (Sillitoe 1998a).

2.4.1 Defining local knowledge

According to the Oxford Dictionary of English, knowledge can be broadly defined as information and skills that one obtains through a process of education or generates through experience, and it includes both practical and theoretical comprehension of a given subject⁹. The literature is overwhelmed by definitions of LK (Langill 1999, Antweiler 2004, Raymond et al. 2010); broadly speaking, LK presents everything that

⁹ <https://www.lexico.com/en/definition/knowledge>

people living in a certain location know about their area (Smith 2011). It has origins from within a certain community or spatial location, but also includes influences of the knowledge coming from the outside of the community/location, since it constantly evolves (Mercer 2012).

A number of terms for LK are commonly found in the literature, including: ‘indigenous knowledge’ (IK), ‘traditional knowledge’, ‘traditional ecological knowledge’ ‘rural people’s knowledge’, ‘indigenous technical knowledge’, ‘traditional environmental knowledge’, ‘folk knowledge’, ‘people’s science’ and ‘folk science’ (Blaikie et al. 1997, Sillitoe 1998b, Antweiler 2004, Dekens 2007, Shaw et al. 2009a, Mercer 2012). The application of a specific term seems to depend on the academic discipline, context and language (Kelman et al. 2012). In DRR literature, the term IK is often used. However, the term LK seems the most appropriate in the context of this investigation for several reasons:

1. acknowledgment that conceptually broader terms such as LK provide a more comprehensive depiction of a phenomena (UNDP 2008, Wisner 2009). LK represents knowledge of all people who have lived in a certain locality for a long period of time (Hiwasaki 2017), whereas the term IK is limited to indigenous populations (Langill 1999).
2. characteristics of the case study area considered in this research (e.g. high presence of development partners and penetration of modern technologies) which make the term IK constraining, and
3. vagueness and political connotation of the term IK, and its perceived spatial and temporal continuity, whilst in reality, it hardly exists in intact form (Antweiler 2004, Briggs 2005, Islam et al. 2018, Acharya and Prakash 2019).

This research therefore conceptualises that LK

‘encompasses the knowledge and practices that are acquired by local people over a period of time through the accumulation of experiences over generations, society-nature relationships, and community practices and institutions’ (Kniveton et al. 2015, p.38)

In addition, the use of LK in the present research is further expanded to include both ‘traditional’ and ‘new’ experimental knowledge produced and applied by local people (Jacobi et al. 2017). Simplified, in the context of DRR, LK is what communities know

about natural hazard risks, how they perceive these risks and what actions they take to address them (Dekens 2007). It includes peoples coping and adaptation strategies and learning occurring due to being impacted by disasters (Tran, Shaw, et al. 2009).

2.4.2 *Characteristics of local knowledge*

LK is context-based and unique to a specific community, culture or society (Warren 1991, Fernando 2003, Shaw et al. 2009a). It is engrained in a local socio-ecological context (Hilhorst et al. 2015), and varies between different localities in time and space (Agrawal 1995). Exactly this local character is what gives it agency, power and relevance in development (and by inference, DRR) (Briggs 2005). It has a potential to provide valuable inputs into development projects, since LK holders have intimate knowledge of their areas. LK is a part of local communities practices and institutions (Fernando 2003), and is a basis for decision making at local levels (Nyong et al. 2007). Since it is context-bound, it cannot be generalised (Kelman et al. 2012); hence, it is challenging to raise it in policy context (Mercer 2012).

LK has been developed over long periods of time and is typically passed down from generation to generation, primarily orally through word of mouth, and it is mostly undocumented (Warren 1991, Shaw et al. 2009b). It has a strong learning component to it, since it has been developed based on experimentation, innovation, trial and error (Shaw et al. 2009a), as the needs of communities change (Agrawal 1995). For instance, while people are experiencing disasters, they develop new layers of understanding (Mitchell et al. 2016, Rose and Jayawickrama 2016) and accommodate change (Acharya and Poddar 2016). LK is driven by pragmatic needs of everyday life and is embedded in people's livelihoods (Dekens 2007). Therefore, LK is often tacit, which means that it is part of people's everyday lives, not easily expressed in words and accessible to outsiders (Wisner 2009, Mercer 2012).

Despite common misconceptions, LK is anything but static; it is fluid and continuously evolving both as the needs and experiences of local people change, and through exposure to external knowledge systems (Agrawal 1995, Flavier et al. 1995, Sillitoe 1998b, Gaillard and Mercer 2013, Hilhorst et al. 2015). LK, as any other knowledge system, has not evolved in isolation, but has benefited from cross-fertilisation with other knowledge (Tengö et al. 2014). This dynamic nature is exemplified in the concept of 'hybridisation' where LK is continuously negotiated, fed, co-produced and intertwined with 'Western',

‘scientific’ or ‘external knowledge’ (Fernando 2003, Briggs 2005, Mercer et al. 2010, Hiwasaki et al. 2014a, Hooli 2016, Acharya and Prakash 2019). For instance, Acharya and Prakash (2019), while researching LK for flood forecasting in India, found that people regularly triangulate between the local signs they use and official forecasting information they hear in the radios. As discussed by Mercer (2012), communities are pragmatic and opportunistic in assessing what external knowledge is appropriate for local usage. Briggs (2005) points out that, essentially, local people do not care where the knowledge is coming from as long as it serves its purpose.

Furthermore, LK is not homogenous and it is not a community trait. Among others, factors such as age, gender, power status, poverty levels, and social grouping create diverse sets of knowledge within a community and condition access to LK and its use (Wisner and Luce 1993, Sillitoe 1998b, Briggs 2005, Dekens 2007, Wisner 2009, Hillhorst et al. 2015). However, this dimension is far too often neglected when working with communities. As Heijmans (2012) points out, LK is not a barrel that can be simply tapped into. Within a community, different people have different knowledge. The knowledge is also differentiated across scales; in other words, different bodies of knowledge can be found at individual, household and community level (Dekens 2007, Hillhorst et al. 2015). For instance, people with different occupations have different knowledge pertinent for DRR (Wisner 2009).

An important component to be considered is that LK is also determined by local power relations, and has a power component attached to it. This results in both not everyone having the same access to knowledge as well as in knowledge of certain community groups (i.e. mainly local elites) being privileged when external parties work with communities. For instance, Cronin et al. (2004), while researching LK related to volcanic hazards in Vanuatu found that women have limited access to warning information and can be excluded during evacuation. Similarly, in India, Acharya and Prakash (2019) found that social and cultural practices do not allow women to access local markets, where they could access flood warning information. Furthermore, Dekens (2009) found that in Nepal LK can be monopolised by local elites. It is acknowledged that power relations at local levels will have a significant influence on what LK is revealed and made available to external stakeholders (Dekens 2007). Hence, any meaningful involvement with LK cannot ignore issues of local politics, power relations and hegemony (Briggs and Sharp 2004, Sillitoe 2004, Briggs 2005, Smith 2011, Acharya and Prakash 2019).

It is apparent that LK is shaped by and integrates aspects of social, economic and political realities at local level (Langill 1999). For this reason, it cannot be detached from its imminent social, political and cultural contexts, cautioning against ‘packaging’ with documentation of LK without considering these factors (Briggs 2005). Ironically, the approach that aims to ‘upscale’ LK risks losing its main strengths, i.e. its local character (Briggs 2013). However, current development agenda strongly advocates this generalisation of LK (Smith 2011). There is a need to take into account how this knowledge modifies once when taken out of local context (Sillitoe 1998b), since it is only really meaningful within its spatial and temporal boundaries (Dekens 2007). Its local embeddedness is what limits its transferability to different contexts (Hillhorst et al. 2015), although others (Shaw et al. 2009a, Hiwasaki et al. 2014b) argue that some aspects of LK (e.g. technical aspects, such as local construction practices) can be transferred in similar contexts.

2.4.3 Local knowledge in disaster risk reduction

People living in hazard-prone areas have developed complex and sophisticated LK to deal with disasters (Wisner et al. 1977, Cuny 1991). People know a great deal about hazards in their areas and their vulnerabilities (Tran, Shaw, et al. 2009), and they use LK to prepare for, mitigate, respond to and recover from the disaster effects (Mavhura et al. 2013). Hence, LK is often portrayed as a component of community resilience in the context of natural hazards (López-Marrero and Tschakert 2011, Gómez-Baggethun et al. 2012, Hooli 2016, Jon 2019). Taking into account the increasing frequency and magnitude of disasters, there is now an increasing interest in LK, both in research agendas and policy settings. It is acknowledged that since DRR is inherently a complex problem, there is a need for the appreciation and utilisation of all available knowledge, be it local or scientific (Weichselgartner and Pigeon 2015). Yet, despite this growing interest and realisation that LK can greatly contribute to DRR, its use in DRR practice is questionable (Hiwasaki 2017, Dube and Munsaka 2018). LK is still seen as inferior to technical approaches based on engineering and physical sciences and is thus undervalued; therefore, the potential for LK in DRR has not been fully realised (Twigg 2015, Coles and Quintero-Angel 2018).

Similar to the lack of a universal definition of LK, there is no accepted classification of what constitutes LK within DRR. Different authors have provided different

classifications. For instance, Shaw et al. (2009a) classify LK under two categories: technology and belief systems, where technology refers to more physical features (e.g. local construction) and belief systems encompass local culture, traditions and social systems. Twigg (2015), based on Clarke Guarnizo (1992) explained LK through four broad categories of coping strategies: 1) economic/material (e.g. crop diversification, additional labour, savings and credit schemes), 2) technological (e.g. land use strategies, early warning, construction practices), 3) social/organisational (e.g. kinship networks, community-based organisations), and 4) cultural (e.g. risk perception, religious views). One of the most comprehensive classifications was developed by Dekens (2007), based on literature review, and is presented in Figure 2.7.

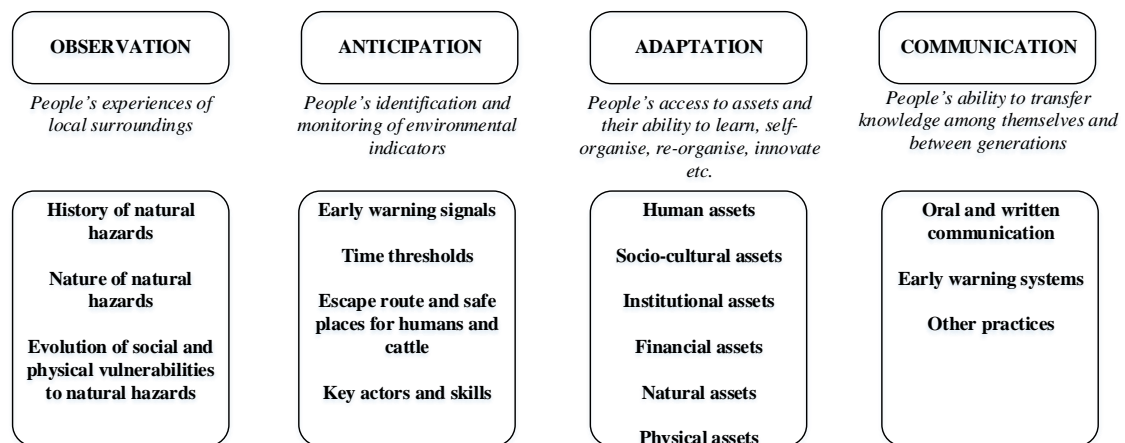


Figure 2.7 Four pillars of local knowledge in DRR (adopted and modified from Dekens, 2007)

Dekens argues that LK involves knowledge of observation, anticipation, adaptation and communication. The study found that LK is composed of different knowledge types (e.g. technical, ecological, historical), practices (e.g. short and long term), beliefs, values and worldviews and that its application has an effect on livelihood sustainability and community resilience building (*ibid.*).

Despite differences in classifications, various scholars have represented LK in the context of DRR as a multi-layered, crosscutting and complex knowledge system that incorporates various aspects of DRR. For instance, LK commonly found in communities ranges from people having knowledge of historical events and their impacts, to using locally available materials for disaster-resilient construction, using environmental indicators to forecast floods and droughts, relying on social networks and local institutions, and using songs and poems to communicate warning messages and raise general risk awareness.

Generally, research on LK under the realm of DRR has focused on documentation of the various types of LK. However, LK for DRR still stays undocumented in many contexts. One of the reasons why LK is underutilised is exactly the fact that it is mostly not documented; therefore, it is difficult to make an explicit link between LK and DRR (Dekens 2009, Mercer et al. 2009). However, there are increasing number of studies available reporting a vast array of LK (e.g. Irfanullah and Motaleb 2011, Fabiyi and Oloukoi 2013, Santha et al. 2014, Masinde 2015, Lunga and Musarurwa 2016, Osuret et al. 2016, Islam et al. 2018, Ngwese et al. 2018). Documentation is essential and a necessary step for raising the profile of LK in DRR, as it demonstrates that local communities know a great deal about disasters and ways to manage them. However, documentation alone does not result in LK being increasingly used in the field of DRR (Hiwasaki et al. 2014a), as it focuses only on manifestations of LK and offers shallow insights into the nature of this knowledge and its complexity (e.g. power aspects). Most importantly, the focus on documentation also brings a danger that LK is perceived by development agendas as something that can be packaged and transferred to different contexts (Hilhorst et al. 2015, Klenk et al. 2017). In an outcome and result focused approach to design and implementation of DRR projects across the world, this presents an appealing idea. However, it de-contextualises LK without engaging with the social, economic and political context within which LK is used and produced (Briggs 2005).

Therefore, there is increasing critique that the focus on documentation of good LK practices comes at the expense of a deeper understanding of the process of LK (Briggs 2005, Dekens 2007, Naess 2013, Klenk et al. 2017, Rahman et al. 2018). This has been evident in disaster literature, where studies focusing on process perspectives remain scarce. As Briggs (2013) argues, while positioning LK as a false dawn in development, there is a lot of good material reporting examples of LK, whereas we lack an understanding of the processes behind knowledge production and use. Especially in a rapidly changing world, it is important to understand the principles and processes behind LK as opposed to mere documentation (Tran, Takeuchi, et al. 2009). This includes developing deeper understanding of how LK is created, observed, acquired, discussed, learned, transferred and shared, stored, refined, perceived and used (Dekens 2007, Briggs 2013, Rahman et al. 2018).

Furthermore, understanding process perspectives on LK also requires consideration of how LK interacts with external knowledge and institutions, and approaches to development in general, which is at the moment, limited (Arce and Fisher 2003, Pottier 2003, Naess 2013, Carby 2015). This is in line with an argument by Cook (2015), who suggests that there is a lack of understanding of how LK is valued and perceived by external DRR stakeholders, such as government and NGO workers. Taking into account that these stakeholders are instrumental in increasing the inclusion of LK in official DRR approaches (including CBDRR), this lack of knowledge is problematic.

2.4.4 Integration between local and scientific knowledge

2.4.4.1 A need for integration

Notable exceptions to a predominant focus on documentation of LK in the field of DRR are studies dealing with the ways to integrate LK and SK. There are increasing calls for a need to integrate LK and SK¹⁰ in order to deliver effective DRR at local levels (Mercer et al. 2009, Cadag and Gaillard 2012, Bacud 2018, Balay-As et al. 2018, Acharya and Prakash 2019, Chowdhoree 2019), and the focus on integration has been one of the main focuses of the researchers of LK in DRR recently. The reasons for integration are substantial. For instance, Tengö et al. (2014) and Makondo and Thomas (2018) call for integration in the light of unprecedented global environmental drivers, such as climate change. This results in communities experiencing disaster events with intensity and frequency outside of their lived experience, seen as another reason for integration (Kelman et al. 2012). Integration is also needed for making SK and various technologies (e.g. early warning systems) appropriate for local contexts (Mercer et al. 2009), but also contributes to scientific understanding since LK provides localised information (Walshe and Nunn 2012, Kettle et al. 2014). Integration is a means for mobilising community capacity (Tran, Shaw, et al. 2009). Moreover, integration is seen as a way of ‘banking’ on the strengths of both local and scientific knowledge; as Mercer (2012) argues, the limitations of one knowledge system can be addressed by the strengths of the other, and vice versa.

The approach to DRR has for a long time favoured SK and seen it as superior to LK (Mercer 2012, Coles and Quintero-Angel 2018). Therefore, much attention has been given to draw the differences between SK and LK. One of the major differences is that

¹⁰ In line with Mercer (2010), this thesis refers to SK as the knowledge that involves western technology or techniques that have been empirically proven and are based on established methodologies. In the literature on LK, the term SK is most commonly used, but there are other terms such as ‘outside knowledge’, ‘external knowledge’, ‘Western knowledge’.

SK is seen as universal and global, whereas LK is specific to a location and context (Mercer 2012). SK is deemed analytical and objective, based on established methodological and experimental procedures, while LK is perceived as intuitive and objective (Sillitoe 2003). While SK has been generated through formalised processes, LK stems from experience, human-environment interactions and culture (Raymond et al. 2010). Furthermore, SK is explicit (i.e. documented), while LK is often tacit (i.e. more embedded in actions and practices, not documented) (Mercer 2012). As argued by Agrawal (1995), when the literature engages in the discussion of differences between LK and SK, three main dimensions are presented: 1) substantive: differences in subject matter and characteristics, 2) methodological and epistemological: different methods and worldviews, and 3) contextual: LK more embedded in the context.

In spite of these being discussed in the literature, attempting to delineate differences between SK and LK is arguably unhelpful, as it creates binaries and dichotomies, and shifts the attention away from developing understanding of how these can work together in enhancing local-level resilience. It also reinforces and maintains the power status of SK over LK (Balay-As et al. 2018) where LK continues to be perceived and treated as a ‘lesser’ knowledge compared to SK. Agrawal (1995) argues that this division is artificial, suggesting instead that a focus needs to be on understanding that there are multiple domains of knowledge with differing epistemologies. It is what Raymond et al. (2010; p.1770) refer to as ‘*epistemological pluralism*’, an approach that acknowledges that there are different ways of knowing, and in these different ways of knowing, what is seen as a valid and accepted form of knowledge differs.

Neither local nor scientific knowledge have developed in isolation, and they have a long history of interaction through which they have shaped one another (Briggs 2005, Smith 2011, Kniveton et al. 2015). Many scholars raised this point, and the hybrid nature of LK has been discussed in Section 2.4.2. However, the binary division and dichotomy still persists in DRR arenas (Balay-As et al. 2018), and LK is often considered in isolation (Hooli 2016). It is therefore evident that LK is marginalised, and in the process, its potentially valuable contributions for problem solving are lost (Coles and Quintero-Angel 2018). Within DRR, the binary needs to be deconstructed, and the focus should be on how LK and SK complement each other, since no form of knowledge is absolute and each makes a contribution (Kelman et al. 2012, Mavhura et al. 2013, Mitchell et al. 2016). By moving attention away from talking about the differences between LK and SK, more

emphasis can be put on understanding the complementarities, which presents a step forward into practical consideration of LK (Ludwig 2016).

2.4.4.2 *Integration approaches*

An increased interest in integration of LK and SK has resulted in a number of publications on the topic, outlining the application of specific integration tools. For instance, Cronin et al. (2004) used PRA techniques to develop local disaster management and evacuation plans for volcanic hazard management on Ambae Island in Vanuatu. Other examples include using participatory numbers with disaster prone communities in Samoa (Gaillard et al. 2016); GIS for participatory mapping in flood prone communities of Vietnam (Tran, Shaw, et al. 2009); using Participatory Learning and Action Tools for integrating official and local meteorological forecasts in the Philippines (Ton et al. 2017); using Participatory 3-Dimensional Mapping with flood prone communities in the Philippines (Cadag and Gaillard 2012); using participatory downscaling and knowledge timelines in Kenya and Senegal for integrating climate and weather information (Kniveton et al. 2015). These approaches demonstrate that the application of participatory methodologies creates a facilitating platform where meaningful dialogue between knowledge holders, of both LK and SK, can take place; as a result, knowledge can be integrated.

Apart from dealing with specific tools, there has been far less emphasis on the process of integration, and understanding what it entails. A notable exception is a process framework by Mercer et al. (2010) developed while investigating how SK and LK could be integrated for decreasing vulnerability to environmental hazards in Papua New Guinea (Figure 2.8). The framework is based on participatory methodologies and entails four steps: 1) community engagement, 2) identification of vulnerability factors, 3) identification of indigenous and scientific strategies, and 4) creating an integrated strategy, the application of which results in reduced vulnerability. The authors describe the framework as a cyclic process that needs to be continuously monitored and revisited by communities. Although the framework presents one of the first and most comprehensive steps of what integration entails in practice, it is not without criticism. For instance, Briggs (2013) points out that the framework did not pay enough detail to community engagement mechanisms, it did not take into account different power relations within a community, nor did it provide sufficient detail on how the integrated strategy will be created. Additionally, it can be argued that the framework proposed steps that need rather long periods to be implemented, which can present an obstacle for the limited time and budget resources of

other stakeholder groups that are recommended to be involved in the process (e.g. NGOs, local government). There is no clarity regarding how motivated the communities would be to revisit the process in the absence of external facilitation. Finally, it remains unclear in the framework whether and to what extent local communities have already integrated LK and SK, and how this hybridised knowledge sits within the larger integration process.

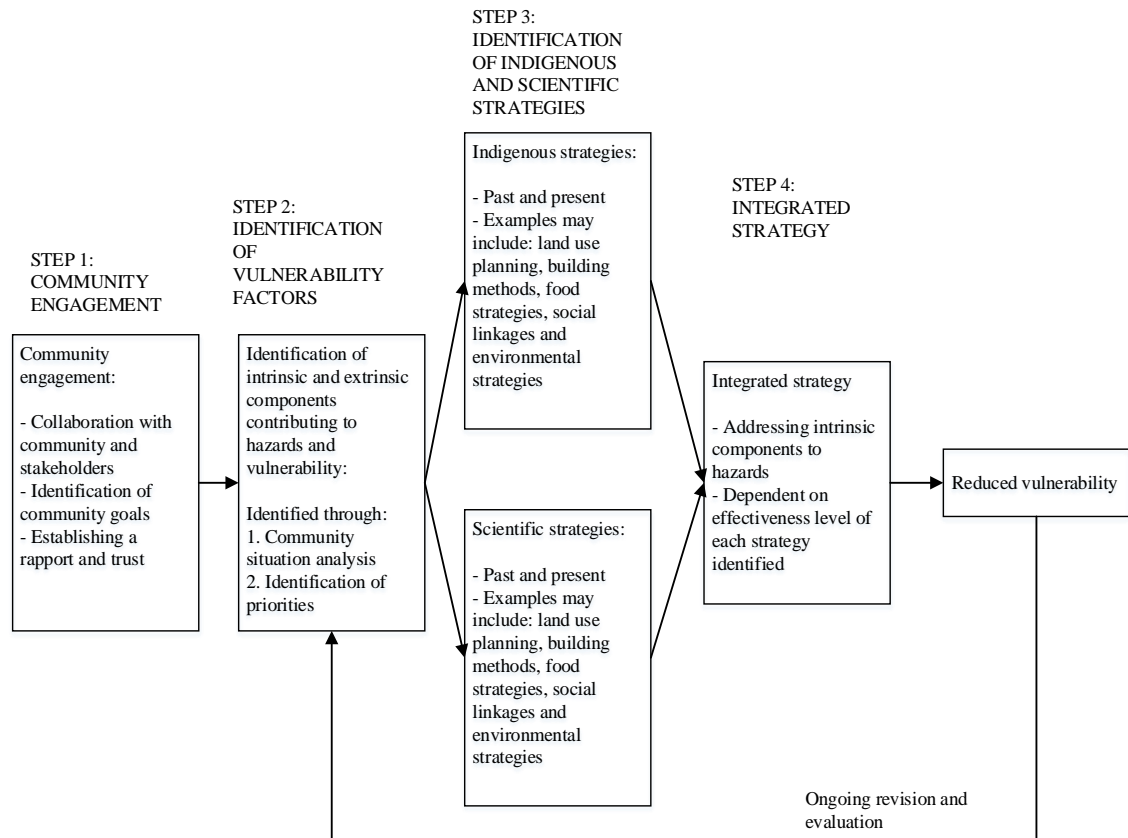


Figure 2.8 Process framework for knowledge integration (adopted from Mercer et al. 2010)

Another notable process framework was developed by Hiwasaki et al. (2014a) (Figure 2.9). In comparison to Mercer’s framework, this framework envisioned a more important role of science. In their approach, one of the modes for integration is validation of LK with scientific methods. Therefore, there is a need for involvement of scientists from different disciplines that would provide scientific explanation for various components of LK. Those that have scientific explanation will be then used in developing an integrated strategy, whereas those that do not will, according to the authors, be difficult to integrate with science. Although the authors provided a very detailed process, it can be argued that not enough attention was given to the implication of power relations at the local level, which might influence what knowledge serves as an input into the integration process. Furthermore, the integration does not account for how the power differences between

scientists, as external to community, and communities themselves, influence the knowledge integration process. Moreover, the framework does not address, but rather just acknowledges, the controversy of whether using SK to validate LK reinforces the dominant role of SK (Briggs 2013). Similar to the criticism of the Mercer et al. (2010) framework, it does not account for whether local people are already integrating; hence, it misses an opportunity to learn from an ongoing process.

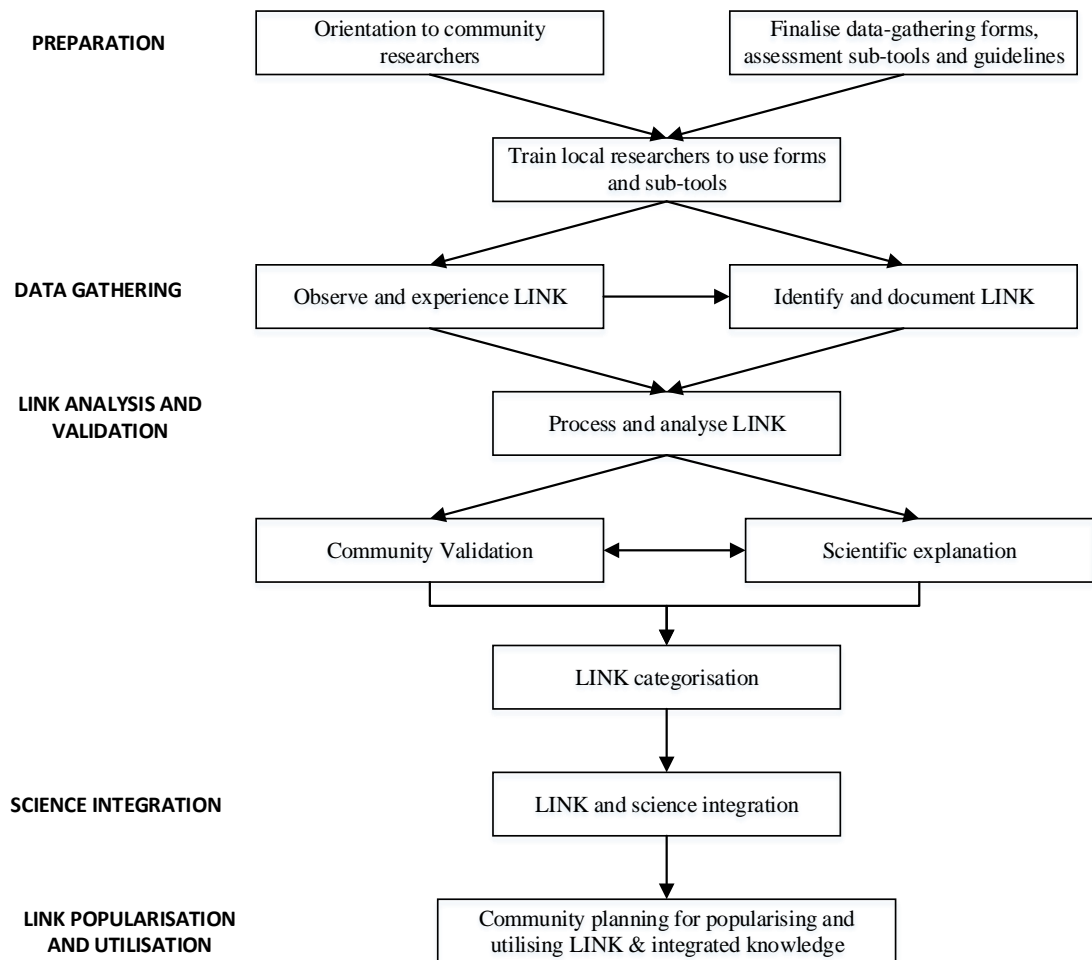


Figure 2.9 Framework for integration of LK and SK (adopted from Hiwasaki et al. 2014a)

When integrating SK and LK, it is of utmost importance to create dialogue and include all different stakeholders involved in DRR, from vulnerable communities (including those most marginalised) to scientists, governments and NGOs (Gaillard and Mercer 2013, Hiwasaki 2017). Furthermore, integration outcomes need to be comprehensible to local communities (Walshe and Nunn 2012), as the ultimate aim is to create strategies that will enhance their resilience. Crucial for successful integration, but also one of the main challenges in the process is that no knowledge is marginalised and perceived as inferior (Coles and Quintero-Angel 2018).

Despite emphasising the need for integration, it is acknowledged that integration is inherently challenging (Raymond et al. 2010) and is rarely achieved in practice (Mercer 2012, Gaillard and Mercer 2013). Mercer (2012) pointed out it is the uneven power relation between SK and LK that leads to the dominance of SK, and the place-specific characteristic of LK that makes it difficult to take it out of the context. Besides uneven power between SK and LK, integration is also challenged by local power dynamics, which are often invisible to the outsiders, making it difficult to understand whose knowledge counts (Briggs 2013). Furthermore, there is always a difference in power between community members and researchers, government representatives and NGO staff (Gaillard and Mercer 2013).

2.4.5 Benefits and limitations of local knowledge

2.4.5.1 Benefits of local knowledge

Since entering the discourse, proponents of LK have outlined its many benefits. Many of the benefits discussed in the literature reason with the benefits of CBDRR discussed in Section 2.3.5.1.

Overall, the underlying rationale is that basing interventions on LK means that actual needs are presented (Brokensha et al. 1980, Takeuchi and Shaw 2009, Nkomwa et al. 2014, Coles and Quintero-Angel 2018) as it gives agency and voice to local people (Molina 2016). LK is a means for participation, empowerment and increased project sustainability (Allen 2006, Dekens 2007, Jacobi et al. 2017). Inclusion of LK is cost-effective, since it is based on local capacities and it can reduce a need for external assistance and aid; this is especially relevant in the developing world context where local governments are operating on limited budgets (Howell 2003, Molina and Neef 2016, Dube and Munsaka 2018). Interestingly, recognition of LK is seen to improve the application of externally introduced interventions and technologies (Brokensha et al. 1980, Nyong et al. 2007, Bacud 2018). When LK is taken into account, partnerships between local communities and external stakeholders can be fostered (Nguyen and Shaw 2009, Tran, Takeuchi, et al. 2009).

Although it is indisputable that bringing LK into development and DRR has many benefits, Briggs (2005) argues that development practice has approached LK uncritically, seeing it as something that could be appropriated in development and as a unitary body of knowledge. This led to its inclusion not being as beneficial as hoped. It is therefore

crucial to understand the limitations of LK (*ibid.*), and not assume that LK is a panacea for development (Smith 2011).

2.4.5.2 Limitations of local knowledge

The uncritical approach to LK dismisses the political, social, economic, cultural and institutional setting in which LK is produced (Heijmans 2012, Briggs 2005, Smith 2011, Hilhorst et al. 2015). LK is not always inherently good. As presented in Section 2.4.2, certain community groups are excluded from accessing LK due to cultural practices and local power dynamics. What LK is available to local people and how effective this knowledge is, is also conditioned by people's socio-economic status. For instance, Mavhura et al. (2013), while researching LK for flooding in Zimbabwe, found that the effectiveness of LK is determined by the socio-economic conditions within which people live. Smith (2011) also argued that although solutions might be local, people might not necessarily have the means to implement them. Therefore, when labelling LK as a tool for development or a component of resilience, it is crucial to engage with the socio-economic dimensions of a community (Dekens 2007). Furthermore, it is important to engage with the political dimension of LK, manifesting through power relations at the community level. Arche and Fisher (2003) argue that the failure to account for the politics of LK brings about an incorrect representation of LK as a local resource without understanding the realities of this knowledge on the ground.

One of the most important limitations of LK in DRR is its applicability in light of extreme events, e.g. extreme flooding (Kelman et al. 2012, Mavhura et al. 2013, Hilhorst et al. 2015, Twigg 2015). LK for DRR is produced and tested through previous experience with natural hazards. Hence, extreme events, since they are often outside of the lived experience of local people, might mean that LK is not applicable and not able to significantly help communities with those events.

Many authors have raised a need for understanding the processes that influence production and use of LK in light of environmental, socio-economic changes, political and cultural changes (e.g. Wisner et al. 1977, Blaikie et al. 1997, Sillitoe 1998b, Mercer 2012, Wamsler and Brink 2014). Pressures include climate variability and change, migration, modernisation resulting in lifestyle changes, market economy, urbanisation, deforestation, influence of external knowledge and technologies, population growth and changes in land use. These have influenced the use and applicability of LK significantly,

and threaten local lifestyles, cultures and values (Agrawal 1995). For instance, Kagunyu et al. (2016) reported how climate variability has resulted in more frequent and intense droughts in Kenya, which has led to unreliability in the local drought forecasting indicators used by pastoralists. Similarly, in the Philippines, Molina (2016) found that the applicability of LK is challenged by the changing disaster contexts brought about by climate change. As argued by Wamsler and Brink (2014), the unprecedented pressures that local communities are exposed to means that people have a different starting point from which to cope. Hence, people's ability to adapt and incorporate new learnings into their LK can be hindered (*ibid.*). Therefore, it is of extreme importance to critically explore the applicability and effectiveness of LK (Gaillard and Mercer 2013).

Furthermore, the process of modernisation has brought challenges in terms of the intergenerational transmission of LK, whereby younger generations show a lack of interest in local methods and are motivated to live 'modern' and 'technological' lifestyles (Iloka 2016, Molina and Neef 2016). Outcomes of approaches in which development and DRR were delivered in a top-down manner have led to an increased dependence on technology and people abandoning their LK (Mercer et al. 2009). For instance, Rautela (2005) reported how in the Indian Himalayas, local communities have disregarded local earthquake-resistant construction practice in favour of more 'modern' and 'scientific' approaches. Similarly, Delica-Wilson and Gaillard (2012) point out that people neglect their LK because external stakeholders, such as government workers in communities, have treated them as ignorant and not qualified to make decisions.

2.5 Flooding and local knowledge in Malawi

While the review of the literature thus far has engaged with global literature on the topic, this section will present the status of knowledge on flooding and LK in the context of Malawi.

2.5.1 Flooding in Malawi

Floods are the most common natural hazard in Malawi (DoDMA 2015a). Based on an assessment using the national database, UNECA (2015) estimated that floods account for 48% of all disasters recorded in the 1946-2013 period. Using flood statistics between 1970 and 2017, obtained from the government agencies in Malawi, this research reports a recorded number of 2,279,801 affected people and 637 deaths. Due to the prominence of the problem in the country, this research has an exclusive focus on flooding, although other natural hazards (e.g. dry spells and droughts) also present a problem. In order to

provide the contextual basis for understanding the analysis presented throughout this thesis, it is important to understand the nature of both flood hazard and vulnerability in the Malawian context.

2.5.1.1 Flood hazard in Malawi

With a tropical wet and dry climate, flooding in the country occurs as a result of heavy rainfall during the rainy season (October to April), with peaks in January and February (Ngongondo et al. 2011, Simelton et al. 2013, UNECA 2015). The rainfall is not homogenous within the country and is a function of relief, with variations of annual rainfall from 700 mm in the low-lying areas to 2500 mm in the highlands (Ngongondo et al. 2011, Nicholson et al. 2014). Flooding in the low-lying areas is therefore often caused by the rainfall falling in the highlands (Jury 2014). According to DoDMA (2015b) rainfall in Malawi is characterised by three systems: the Inter Tropical Convergence Zone (ITCZ), the Zaire Air Boundary/Congo Air Mass and Tropical Cyclones from the Indian Ocean. While the ITCZ results in heavy rains between December and March, convective thunderstorms occur in October/November, with lighter rains in April due to cyclones (Shela et al. 2008). Furthermore, Malawi is vulnerable to the influence of global atmospheric oscillations (e.g. La Niña) that result in flooding (Jury 2014, Botha et al. 2018).

In Sub-Saharan Africa, changes in rainfall due to climate change might increase the frequency and magnitude of extreme weather events, including floods (Fauchereau et al. 2003, Connolly-Boutin and Smit 2016). Generally, Global Circulation Models (GCMs) and Regional Circulation Models (RCMs) for Malawi project reduced and erratic rainfall and increased temperatures (DoDMA 2015b). Based on the analysis of recorded rainfall amounts in the period from 1961-2009, Simelton et al. (2013) found decreasing rainfall totals, an increase in the number of dry days, and high inter-annual variability in terms of rainfall onset in Malawi. This can have significant consequences (e.g. food insecurity) in a setting where there is overall reliance on rain-fed agriculture (Devereux 2007, Sutcliffe et al. 2016).

Another important factor shaping flood hazard in Malawi is extensive environmental degradation (Mwale 2014), namely land use and land cover (LULC) changes where forest cover is converted to agricultural land (Palamuleni et al. 2011, Gomo et al. 2018). The largest catchment in Malawi, the Shire River Basin, is a part of the Zambezi River Basin,

where a recent study found 4.6% loss in tree cover and a 16% increase in agricultural land in a period from 1992 to 2016 (Gomo et al. 2018), with changes mainly occurring in Malawi and Mozambique. From 2010-2015, Malawi lost 2.8% of its forest (MoAIWD 2017a). Next to the loss of forest cover, the LULC changes in Malawi occur due to firewood collection, charcoal production, population growth and generally, high levels of poverty (Munthali et al. 2019). The link between poverty and land degradation is well established in the academic literature, with the understanding that poverty both increases degradation but it is also exacerbated by people living in degraded lands (Reardon and Vosti 1995, Duraiappah 1998, Barbier and Hochard 2016). In Malawi, environmental degradation has increased flood hazard in two ways. Firstly, by increasing the runoff rates from degraded lands, and secondly, by siltation of the rivers. For instance, while evaluating the influence of LCLU changes on hydrological regime in the Upper Shire Catchment, Palamuneli et al. (2011) found increased flow peaks and faster travel times. Shela et al. (2008) estimated the average sediment yield in the Shire River Basin at 200 to 300 t/km²/year, with severe sedimentation appearing also in Ruo and Mwanza Rivers in the Lower Shire Basin. This results in siltation of river beds, reducing the flooding thresholds (Nillson et al. 2010, Mwale et al. 2014). In addition to rainfall characteristics and LULC changes, Mwale (2014) identified that flood hazard in Malawi is shaped by basin-specific topography, location, hydrology and soil structure.

2.5.1.2 Flood vulnerability in Malawi

Two of the main determinants of flood vulnerability in Malawi are high levels of poverty among its residents and a heavy reliance on rain-fed agriculture. In Malawi, 84% of population is living in rural areas, which are a home for approximately 90% of country's poor (Pauw et al. 2011, MoAIWD 2017a). In their analysis of the economic costs of flood events in Malawi, Pauw et al. (2011) calculated that on an annual level, the national poverty headcount increases by 0.91% due to flood effects. In Malawi, poor households, with fragile livelihoods (i.e. farming on the floodplains) and generally poor conditions of houses (i.e. poor construction materials) are severely affected even when they lose only a few assets during the floods (MoAIWD 2017a).

Malawi's economy is agro-based, with agriculture constituting over 30% of the GDP and employing 64.1% of total labour (Botha et al. 2018). Smallholder farming contributes around 70% to the country's agricultural GDP (*ibid.*), and 85% of the population relies on agriculture as their main source of livelihood, most of which are smallholder farmers

(Makate et al. 2019). An overwhelming majority of smallholder farmers rely on a single rain-fed season to maintain their livelihoods (Brown 2011), making them highly susceptible to the impacts of floods (Devereux 2007). People reside and farm in areas vulnerable to flooding (i.e. floodplains) due to the availability of residual moisture, whilst the access to irrigation and farm productivity is generally poor, and their exposure to flooding is high (Tchale 2009, Gwimbi 2009). The fragility of livelihoods means that farmers residing in flood-prone areas are generally caught in a disaster-poverty cycle (Lumumba Mijoni and Izadkhah 2009), with smallholder farmers suffering average annual production losses due to flooding of 2.67% (Pauw et al. 2011). Floods negatively influence household crop production and worsen food security (Pangapanga et al. 2012).

Furthermore, flood vulnerability at local levels in Malawi is shaped by factors such as lack of employment opportunities and diversification of the economy, access to basic social services and enforcement of planning regulations, low quality local buildings, poor infrastructure, and low education levels (Mulwafu and Msosa 2005, Brown 2011, Manda 2014, Mwale et al. 2015, Kita 2017b). Furthermore, access to customary land, regulated by traditional leaders, presents an issue, especially in light of increasing population (Kishindo 2004, MoAIWD 2017a). In a period from 1955 to 2019, Malawi's population increased from 3.3 to 18.7 million, with an increase in population density from 34 to 209 people/km² (Worldometers 2019). This sharp population increase put pressure on environmental resources (resulting, for example, in increased deforestation) and led to people having smaller portions of land to cultivate on and further settling in marginalised and flood prone areas (MoAIWD 2017a, Munthali et al. 2019).

There are several studies that focus on flood vulnerability in Malawi. The most comprehensive study available is a quantitative flood vulnerability assessment in the Lower Shire Valley by Mwale et al. (2015). The authors quantified vulnerability through a lens of exposure, susceptibility and capacity, coupled with the thematic areas of sustainable development, namely social, economic, physical and environmental factors. The study suggested that vulnerability of rural communities ranges between low to very high categories, with most of the areas falling under the categories of medium and high classes. Vulnerability arose mainly due to socio-economic and environmental susceptibility, with economic and physical capacities being low (*ibid*). However, the spatial scale of analysis was relatively large, and the quantitative approach might have

not allowed for unpacking the political, social, cultural and economic factors that shape vulnerability at local levels (i.e. villages).

Lumumba Mijoni and Izadkhah (2009) and Kita (2017a) used a PAR model to understand flood vulnerability in Malawi. Both studies underline the contribution to vulnerability of underlying causes (e.g. poverty and limited access to resources), dynamic pressures (e.g. population growth, deforestation, cultivation along river banks) and unsafe conditions (e.g. fragile physical and economical environment). More recently, Chawawa (2018), through a lens of political ecology, studied the self-perceived flood vulnerability of smallholder farmers in two districts, focusing on a village level. The research showed that vulnerability at the local level is differentiated, based on a location within a village, previous experience with floods, age, gender and socio-economic status. Unlike other studies (Lumumba Mijoni and Izadkhah 2009, Brown 2011, Kita 2017b) that generally state a low coping capacity, Chawawa (2018) found out that people living in the flood prone areas have developed a wide range of adaptive strategies (e.g. temporary relocation, social networks), as a result of which they are loathed to permanently relocate and abandon their livelihoods.

2.5.2 Current approaches to flood risk management

Contemporary FRM in Malawi is based on community-based approaches (Lumumba Mijoni and Izadkhah 2009, Mwale et al. 2015, Kita 2017a), and this thesis is exploring CBFRM, which presents a hazard-specific type of CBDRR (WMO 2017), a concept extensively covered in Section 2.3. Research to date acknowledges the existence of CBFRM rather than undertaking any detailed exploration of its setup, realities and challenges, thus creating an apparent research gap. Despite flooding being a serious threat and the most common natural hazard in the country, previous academic literature has not placed particular attention on existing FRM approaches. The existing knowledge base is therefore characterised by reports produced by consultants on behalf of the Malawi government (e.g. Atkins 2011, Nillson et al. 2010, Shela et al. 2008, Botha et al. 2018). Overall, these studies conclude that FRM in the country lacks comprehensive and strategic planning approach and long-term visioning. Furthermore, studies agree that whilst a shift towards risk mitigation, preparedness and recovery can be observed, response remains a prominent component. The general consensus is that the existing FRM in Malawi is in need of improvement. For instance, the World Bank (2010) calls for a good balance of structural (e.g. dikes, storage dams) and non- structural measures (e.g.

flood zoning, building codes, insurance schemes, improvements of EWS) to tackle existing issues. The following sub-sections will review some of the most prominent components of the existing FRM approaches in the country: risk information, weather forecasting, flood early warning systems, physical infrastructure, resettlement initiatives and community participation.

2.5.2.1 Risk information

Flood risk maps are predominantly available in locations where projects are implemented and on small scales (Botha et al. 2018). As found by Shela et al. (2008), detailed flood risk mapping that would serve as a basis for flood zoning and planning has not been done. Flood risk mapping has been done for parts of the Lower Shire Valley (Adeloye et al. 2015, Mwale et al. 2015); however, with coarse spatial resolution, and not for the whole of a district. Overall, the amount and quality of risk information in the country is not satisfactory (Rudari et al. 2016), and there are no standards at the national level for hazard, vulnerability and risk assessments (UNECA 2015).

2.5.2.2 Weather forecasting

In Malawi, for decision making and planning purposes in different sectors (e.g. water, agriculture, disaster risk management) weather forecasting information is used (Vincent et al. 2017). For instance, seasonal forecasts (3-6 months) are used for awareness-raising campaigns in the communities living in flood prone areas. However, a recent study of the region indicated the uncertainty associated with using seasonal forecasts as indicators of the likelihood of flooding (Bischiniotis et al. 2018).

Weather information is collected through a system of about 50 automatic weather stations; however, only 12 are fully operational (Botha et al. 2018). In addition, different international weather and satellite products are used (MoAIWD 2015a). Overall, in the last few years, there have been significant improvements in the spatial resolution of the weather forecasts, with the current resolution being at the district level (Chiotha et al. 2016). Nonetheless, weather information accessibility, accuracy, spatial and temporal resolution and credibility still remains a problem (Vincent et al. 2017).

2.5.2.3 Flood early warning systems

In terms of flood early warning systems (EWS), there are two main systems in the country: national and community-based (CBEWS), experiencing a vast number of

challenges (Table 2.3). The national flood forecasting system for the Lower Shire Valley dates back to 1956 (Shela et al. 2008); it is a manually operated EWS based on readings of water levels and rainfall in the catchments and empirical relationships of threshold flows estimated using simple flood routing procedures (Nillson et al. 2010). In the early 1990s, there were attempts to modernise the system through automation; however, a lack of maintenance and vandalism presented a serious issue (Nillson et al. 2010). More recently, the Government of Malawi engaged in an initiative to modernise the system through installing automated equipment, establishing operational procedures and using state-of-the-art computer hydrodynamic modelling and satellite derived precipitation data (MoAIWD 2015a).

Another prominent type of EWS in the country are CBEWS, supported by NGOs through programmes in which communities are connected (i.e. downstream and upstream communities) and equipped with rain gauges and colour coded staff gauges in the rivers (Atkins 2011). Community members receive training in operating the equipment, taking the readings and are equipped with instruments for warning dissemination (e.g. megaphones, mobile phones) (*ibid.*).

Table 2.3 Challenges with the existing early warning systems in Malawi (based on DoDMA 2015b, Chiotha et al. 2016, Botha et al. 2018)

| Components of early warning systems | Issues with current EWS |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Risk Knowledge | <ul style="list-style-type: none"> • Inadequate emphasis on social, economic and environmental vulnerability • Data gaps • Difficulties accessing data where it is collected • Lack of EW indicators |
| Monitoring and Warning | <ul style="list-style-type: none"> • Many gaps in observing systems for hydro-meteorological hazards • Lack of systems for flash floods • Insufficient multidisciplinary or multiagency cooperation • Seasonal forecasts not downscaled |
| Dissemination | <ul style="list-style-type: none"> • Warning unclear with varying standards of language, often with technical jargon • A need for the development of standards, protocols and procedures for exchange of data, bulletins and alerts • Warnings are not targeted at users • Warnings not timely |
| Response Capacity | <ul style="list-style-type: none"> • Lack of multiagency collaboration and clarity of roles • Lack of public awareness about response plans • The uptake of warning information is low |

2.5.2.4 *Physical infrastructure*

As a part of the overall FRM system, the government built dikes in flood prone areas, beginning in the 1960s (Nillson et al. 2010). In addition, as part of their projects, NGOs built dikes at community levels (Shela et al. 2008). The existing dikes suffer from a lack of maintenance, since neither the government nor the NGOs are involved in long-term maintenance (Botha et al. 2018). Besides, the dikes built by the NGOs often suffer from poor quality, due to the lack of relevant technical expertise (Shela et al. 2008).

2.5.2.5 *Resettlement initiatives*

In Malawi, the government has been increasingly promoting permanent resettlement programmes from flood prone areas in rural (Chawawa 2018, Kita 2019) and urban areas (Kita 2017b). Although, in some cases, people were provided with land to resettle, the programmes have been largely unsuccessful, due to poor planning, lack of livelihood options in new areas, and associated power relations, whereby traditional leaders opposed the relocation due to fear of losing chieftaincy in new areas (Kita 2017b, Chawawa 2018, Kita 2019). More importantly, the government's emphasis on resettlement exemplifies that the existing approach fails to address the underlying causes of vulnerability and even creates further risks (Kita 2017b).

2.5.2.6 *Cross cutting issue in approaches to flood risk management: community participation*

Previous studies identified a lack of community participation in the existing FRM system, although they did not have an exclusive focus on CBFMR. For instance, while researching flood vulnerability in Nsanje, Chawawa (2018) reported that over 90% of households surveyed were not involved in the design of any FRM projects, with those consulted being influential individuals within communities. Similarly, Kita (2017b) found that communities were not involved in planning the interventions as a part of the 2015 floods recovery framework development, but were rather just informed. This had implications during the implementation process, where several cases of community reluctance were reported (*ibid.*). The lack of community participation was also emphasised by Kita (2017a) in planned resettlement, and by Kita (2017c) while evaluating the existing disaster risk governance in the country. The latter study indicated that the government is largely detached from the people that it is representing, thus indicating inadequate participation (*ibid.*).

2.5.3 Local knowledge for flooding in Malawi

Several studies have acknowledged the existence and importance of LK in the context of flooding in Malawi. However, a deeper engagement with the topic remains scarce and is based either on studies done in few villages (Nkomwa et al. 2014, Joshua et al. 2017), or on consultancy reports (i.e. grey literature) (Hajat and Mussa n.d., Chavula 2013, DoDMA 2015b). Generally, previous research is focused on two topics: the documentation of LK as a part of EWS, and identification of coping and adaptation strategies employed by local communities.

Joshua et al. (2017) explored the local indicators for weather and climate forecasting in three villages in Chikwawa. Although not making an explicit reference to flooding, the study documented several environmental indicators in the communities that foretell heavy rains that cause floods (e.g. increasing flowering of certain tree species, increased number of ants). Similarly, focusing on the prediction of heavy rainfall and good rainy seasons, a few other studies documented indicators related to animal and plant behaviour, astronomical and meteorological features (Nkomwa et al. 2014, Hajat and Mussa n.d., Chavula 2013, DoDMA 2015b).

In addition to documenting and discussing the local indicators, some studies identified local coping and adaptation strategies. For instance, Phiri and Saka (2008) found that during flood emergencies, people sell their assets and avoid purchasing non-food items. While identifying LK in the districts of Mangochi and Salima, Hajat and Mussa (n.d.) reported several practices, namely raised foundations, moving upland, riverbank conservation and building of emergency evacuation platforms. Chidanti-Malunga (2011) reported additional adaptive strategies, primarily managing residual moisture for farming purposes, owning houses both in the uplands and in the lowlands, and having multiple plots. More recently, Chawawa (2018), while researching why communities in flood-prone areas refuse to relocate, argued that people, due to long-lasting experience with floods in Nsanje, have developed a culture of living with floods and are hence confident to face them.

Although not designing the pathways through which it can be done, there was mention in the literature of the importance of integrating LK and SK. For instance, in their consultancy study, Chiotha et al. (2011) engaged with finding a scientific explanation for some of the documented early warning indicators for floods and occurrence of rainfall.

They have found that a limited number of indicators have a scientific explanation (e.g. hippos leaving the rivers as they are sensitive to increases in water velocities, prevalence of northerly winds as a sign of good rainfall). However, the majority of indicators had no scientific grounding, and according to the authors, should not be considered as a part of the EWS due to a lack of reliability (*ibid.*). They further argue that LK needs to be enhanced with SK, refined and repackaged before used.

A short review of previous research on LK in FRM clearly points out that this topic requires further research. Firstly, it is evident that the available literature does not engage with a comprehensive and critical consideration of LK for FRM, but rather covers some of its aspects in a disperse manner. Secondly, the research available is limited to mere knowledge documentation, often based on very few villages, whereas understanding of how LK is produced and which factors and processes influence its use remains limited. Thirdly, the existing studies identify a need to integrate LK and SK, but do not address whether and how this could be done. Moreover, the definition of LK in previous studies has indirectly resulted in a narrow approach to the topic, as LK was largely seen as static and there was no consideration of how LK interacts with knowledge coming to communities through external interventions (e.g. CBFRM).

2.6 Chapter summary

The literature review has demonstrated that disasters are complex processes with vulnerability shaped by social, economic and political processes that make certain individuals and social groups more vulnerable than others. However, no individual or group is only vulnerable, as people have various capacities forming their resilience and assisting in different aspects of DRR. Therefore, it is important to also explore people's strengths rather than merely focusing on their vulnerability.

CBDRR approaches have emerged as a response to the failures of top-down and technological approaches to DRR. CBDRR rests on a rationale that communities and their LK are central to DRR at local levels, and has gained significant practical and policy prominence over the last 30 years. CBDRR is still often implemented at community levels rather than with meaningful community participation, and its practical implementation is a complex endeavour. Therefore, there is a need for understanding how theoretical propositions of CBDRR translate to practice through understanding the real-life experiences of CBDRR.

LK presents an integral component of how people deal with disasters. Even though increasingly important, LK for DRR is still seen as inferior to SK. One of the reasons for this is a lack of documentation that would serve as evidence-base for the utility of LK, and there are an increasing number of studies focusing on this aspect. However, mere documentation is not enough. Taking into account rapid environmental change, political and social dynamics, it is important to critically assess LK and understand the principles behind it, including how it is produced, disseminated, used and perceived. Previous research has lacked these elements, and more empirical evidence is needed. Moreover, it is important to explore how LK is influenced by knowledge brought by external stakeholders, such as NGOs and government, and the extent to which LK is actually considered in CBDRR. While there are an increasing number of studies focusing on integration of scientific and local knowledge, integration is rarely achieved in practice, and it is necessary to understand how integration happens on the ground.

Although CBFRM is dominant in Malawi for delivering FRM at local levels, there is no academic research on the topic. In a similar vein, previous studies on LK in Malawi are scarce, lack academic rigour and are focused on limited documentation of LK. There were no studies understanding the extent to which LK is included in CBFRM in Malawi. In order to address the research gaps identified through the review of literature, a qualitative research approach was adopted and will be detailed in the following chapter.

Chapter 3- Methodology

In this chapter, the design and execution of the presented PhD research will be specified. This involves the justification of the ontological and epistemological positions, the choice of qualitative research methods and the case study research design. It furthermore involves outlining the ethical considerations of the study and declaring the researcher's positionality. In this chapter, a more detailed contextual description of the Lower Shire Valley, as a case study for analysis, will be given. Attention will be focused on describing how data was collected from the field and subsequently analysed, prior to discussing tactics used for ensuring research validity and reliability.

3.1 Research philosophy and methodological choice

When engaging in a research process, researchers bring a number of assumptions based on their worldviews that influence how research objectives are shaped and research methods chosen (Guba and Lincoln 1994, Creswell 2013). Hence, it is important to explicitly explain and state these perspectives (Guba and Lincoln 1994, Crotty 1998), by stating one's ontological and epistemological stance and overall methodological choice.

3.1.1 *Ontological and epistemological stance*

Ontology is the study of the '*nature of existence and what constitutes reality*' (Gray 2018, p.21). A researcher's ontological stance influences how they see and study their research subjects (Saunders, Lewis, Thornhill, et al. 2016) as it determines how they see the nature of social reality (Blaikie 2009). This study uses constructivism as its ontological position. As explained by Creswell and Creswell (2018) the constructivist worldview implies that individuals have varied and multiple subjective meanings of their experiences and research should reveal their views on the subject of inquiry. In constructivism, meaning is constructed rather than discovered (Crotty 1998, p.42) through ones' interaction with others, and specific social, cultural and historical norms (Creswell and Creswell 2018). In this research, LK and its use, together with its position within CBFRM were explored through the views and experiences of different stakeholders and their interactions in a specific context.

While ontology presents an approach to understanding the nature of reality, epistemology is concerned with knowledge and questioning what is acceptable and valid knowledge (Bryman 2012, Saunders, Lewis, Thornhill, et al. 2016). Essentially, epistemology questions what it means to know (Crotty 1998). This study is based on interpretivist

epistemology, which emerged in opposition to positivism (Crotty 1998, Saunders, Lewis, Thornhill, et al. 2016). Positivism employs approaches from the natural sciences to study the social world (Bryman 2012). In an interpretivist approach,

‘social reality is regarded as the product of its inhabitants; it is world that is interpreted by the meanings participants produce and reproduce as a necessary part of their everyday activities together.’ (Blaikie 2009; p.99)

It is, therefore, an objective of interpretivist research to provide an in-depth account of how people interpret their social worlds in a given context (Saunders, Lewis, Thornhill, et al. 2016) and to understand people’s behaviours and actions (Bryman 2012). In other words, interpretivists are seeking to gain understanding of a social world through the eyes of the people studied (*ibid.*), especially apparent in a specific stance of interpretivism, phenomenology, which argues that knowledge of social reality is constructed through peoples experiences of that reality (Gray 2018).

In the present research, the starting point was that research participants represent experts on the topic; hence, gaining an understanding of the problem at hand has to be based on their experiences and perceptions. In order to critically explore the role of LK for CBFRM, the perspectives of knowledge producers and users (including communities, NGOs and government officers) need to be understood, involving the different meanings they attach to it. Similarly, to analyse how CBFRM unfolds in a real-life setting and explore existing deficiencies, it is crucial to engage with those involved in the process of CBFRM planning and implementation. Constructivism and interpretivism are commonly applied within a qualitative methodological approach, explained in the following section.

3.1.2 Selection of a qualitative methodological approach

The analysis presented throughout this work is based on a qualitative research approach. Central to this approach is that real people are studied in natural settings (Marshall 1996) and that it provides a complex and detailed understanding of real-life problems (Creswell 2013). Bryman (2012) described qualitative research as: i) providing meaning through the eyes of the individuals studied, ii) putting emphasis on context, iii) providing process perspectives on the phenomena studied, iv) being flexible, and v) being grounded in data. Qualitative research uses various research instruments (e.g. interviews, participants observation, focus group discussions) to generate rich data sets that describe social realities through research participants experiences and perceptions, and is appropriate for asking *why* and *how* questions (Leech and Onwuegbuzie 2007).

Qualitative approach was deemed appropriate for the present study, as LK is produced and used by people. Therefore, to understand its status, agency and role it plays in the way people manage floods at the local level, engaging in an open dialogue with knowledge holders was crucial. To explore pathways for enhancing the role of LK in CBFRM in Malawi, one needs to understand what those involved in CBFRM identify as barriers and as ways forward. All of the above require the gathering of rich evidence through people's personal accounts. Finally, as argued by Creswell (2013), a qualitative approach is appropriate for addressing research objectives that seek understanding of the ways in which a certain problem is addressed in a specific context. Hence, the approach was appropriate for understanding how floods are managed across spatial and social (i.e. local to institutional) scales in Malawi, placing a special emphasis on the role of LK.

3.2 Case study research design

As described by Yin (2009a, p.18),

'a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.'

This study used a multiple-case study research design¹¹. Case study research is prominent when exploring contemporary events and interacting with people experiencing them (Yin 2009a). It provides a holistic perspective and wealth of detail by using different data sources (Flyvbjerg 2006, Creswell 1994, Yin 2009a, 2014, Swanborn 2010).

The case study research design for studying the role of LK in CBFRM in Malawi was employed for several reasons. First, as described in detail in Chapter 2, LK is context-specific and it was, therefore, essential to research it within a specific spatial and social context. Second, flood hazard manifests in a specific geographical location and becomes a disaster when it interacts with vulnerable populations, whose vulnerability is determined by social, political and economic processes; all of which are dependent on context. Third, similar to LK, to understand CBFRM process in practice, one has to engage with a specific manifestation of CBFRM in a given spatial context. Hence, LK and CBFRM

¹¹ Multiple cases in this thesis imply several aspects: i) study conducted in two districts (administrative divisions), ii) a number of local communities researcher engaged with, iii) different stakeholder groups researched (i.e. government, NGOs, communities, FRM consultants). Details of all of these 'cases' will be provided in Sections 3.5 and 3.6.

were explored in the context of local communities in Malawi and existing institutional setup for CBFRM.

In addition to these ‘place-based’ manifestations of phenomena, case studies are useful when research wishes to explore the interaction between different groups and how they interpret each other’s behaviour (Swanborn 2010). This study involved developing an in-depth understanding of the nature of the interaction between different stakeholders within the CBFRM system, as well as exploring how (and if) LK is used within the existing system. Therefore, the case study research design was an appropriate choice.

One of the main critiques of the case study approach is that they are difficult to generalise (Blaikie 2009, Yin 2009a, Bazeley 2013), as the methods employed are not based on probabilistic (i.e. statistical) approaches that allow for making generalisations to populations, based on a limited sample (Flyvbjerg 2006). However, generalisation in case study research is concerned with the expansion and generalisation of theories (‘analytic generalisation’) rather than quantification of frequencies (Yin 2009a). As Bazeley (2013) suggests, findings from case studies can generate valuable insights into processes and causalities, thus contributing to enhancing theoretical foundations. The present research aims at enhancing the existing knowledge base through understanding how the process of CBFRM evolved in practice and the role of LK within it. It has done so through using multiple case studies, which Yin (2009b) sees as a strategy to deliver more compelling and robust evidence.

3.3 Overview of research instruments used for data collection

Adopting a case-study research design requires multiple sources of data and allows for utilisation of a number of different data collection instruments. The analysis presented in this study is predominantly based on primary data collected through semi-structured key informant interviews (KIIs), focus group discussions (FGDs) and direct observations in the field. In addition, secondary data gathered from the available documentation was used. Utilisation of a variety of data collection methods was needed in order to allow for triangulation since the reliability and validity precautions (Section 3.8) in qualitative research ask for the use of at least two different sources of evidence. An overview of different research instruments and their use in relation to research objectives is presented in Table 3.1.

Table 3.1 Research instruments in relation to research objectives

| Research Objective | Data/information needed | Data sources |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Objective 1: To provide a critical exploration of the existing CBFRM in Malawi | <ul style="list-style-type: none"> • Legal, policy and institutional framework for CBFRM • Examples of different CBFRM projects • Qualitative accounts of stakeholders challenges | Interviews, FGDs, direct observation, documents |
| Objective 2: To identify the range and extent of present LK for FRM in Malawi | <ul style="list-style-type: none"> • Evidence of LK in local communities | Interviews, FGDs, direct observation, documents |
| Objective 3: To provide a further understanding of LK for FRM though critically engaging with the process perspectives of LK, including the production and dissemination of LK, its use by different CBFRM stakeholders and their attitudes towards it | <ul style="list-style-type: none"> • Qualitative accounts of stakeholders involvement of LK | Interviews and FGDs |
| Objective 4: To develop recommendations for the enhanced use of LK for FRM in Malawi | <ul style="list-style-type: none"> • Qualitative accounts of different stakeholders recommendations | Interviews, FGDs and literature |

Interviews are the most common method for data collection in qualitative research (Bryman 2012) since they provide rich insights and authentic accounts of participants' experiences (Miller and Glassner 2016, Flick 2018). Interviews are guided conversations with research participants (Yin 2009a), allowing them to raise their own issues (Gomm 2004). This method is a powerful tool for understanding peoples' meanings, interpretations, views, behaviours, attitudes, and experiences (Blaikie 2009, Gray 2018). Furthermore, they are appropriate for providing insights on process-perspectives for different topics of inquiry (Gray 2018). In this study, semi-structured interviews were used, highly regarded for their flexibility (Bryman 2012, Saunders, Lewis, and Thornhill 2016a) since they allow to the interviewer to ask additional questions and probe for clarification (Barriball and While 1994) which might allow them to gain further insights (Bryman 2012). Semi-structured interviews are based on a prepared list of topics/questions for discussion (Gomm 2004); however, the semi-structured nature implies that not all the topics are covered in all the interviews (Bryman 2012, Gray 2018). In this study, semi-structured interviews were conducted with key informants, which are, according to Yin (2009a) crucial for a successful implementation of a case study research, since they provide very rich insights into a matter.

FGDs were selected as the means of gaining insight into different stakeholder groups (i.e. communities, NGOs, government) involvement with LK and CBFRM. FGDs have a purpose different from those of individual interviews since they are based on group interaction (Blaikie 2009), which is a strength when wanting to identify collective perspectives (Halcomb et al. 2007). In an FGD setting, people are exposed to the views of other participants which results in them reflecting on their ideas and attitudes, thus generating additional insights through fruitful discussion and adding to the views of others (Millward 2007, Gray 2018). Gathering insights through FGDs can provide a more realistic account of people's opinions (Bryman 2012), and is beneficial for understanding why people hold certain views and attitudes (Blaikie 2009). FGDs are seen as especially useful for doing research in a culturally different setting (Halcomb et al. 2007), as they provide a researcher with an opportunity to access a wide range of participants (Gray 2018) at relatively low cost (Bryman 2012). Since the case study is located in a culture different to that of the researcher, and there were limited time and resources, these were all factors that influenced a choice of FGDs as a method for data collection.

While designing the questions, both for FGDs and KII, a decision was made to use open-ended questions, meaning that no pre-described answers were given to participants and there was flexibility to ask follow-up questions (Turner 2010). Open-ended questions also enable individuals to share their insights without being influenced by a structured analytical framework (Gomm 2004).

When designing the questions, advice from Bryman (2012) was followed, recommending developing guides in a way that allows for flow in conversation, using a simple language, avoiding asking leading questions, and designing questions in a way that will lead to answering research questions. Before conducting the main fieldwork, question guides were checked for cultural appropriateness and translated by a Malawian researcher based in Edinburgh to ensure all question guides were consistent in terms of the local language.

Furthermore, since the fieldwork involved visiting the flood-affected communities, it was possible to conduct direct observations through field visits, which served as an additional source of primary data. Since case study research is conducted in a natural setting, there is a chance for a direct observation that can provide additional information concerning the study context (Yin 2009a). Direct observation in this study was employed in an ad hoc and informal manner, capitalising on chances to observe flood impacts, local living

conditions, CBFRM projects and physical manifestations of LK while visiting the study sites. It served as an opportunity to expand the contextual understanding of the study sites, while interviews and FGDS formed a primary source of data.

Finally, available documentation was used as a source of secondary data. Documents are commonly used as an additional source of data in conjunction with other qualitative methods such as interviews and FGDs (Bowen 2009). At the inception of the study, a decision was made to use available documentation (e.g. governmental and non-governmental reports, national and local policies) in order to gain further contextual understanding. While some of this documentation was available online, most of it was collected through interaction with stakeholders during field trips in Malawi (Section 3.6).

3.4 Ethical considerations and researchers positionality

Interacting with people necessarily involves considering ethical issues; therefore, it is important to declare how these were considered. The general ethical principles adhered to during data collection will be elaborated in this section, whereas the specifics of their implementation will be covered in Section 3.6, where the fieldwork will be explained. The study received full ethical approval from the Ethics Committee of the School of Energy, Geoscience, Infrastructure and Environment of Heriot-Watt University.

Bryman (2012), based on Diener and Crandall (1978) suggests four ethical principles when conducting social research: i) no harm to participants, ii) gaining informed consent, iii) avoiding the invasion of privacy, and iv) avoiding deception of research participants. The study aligned with these principles.

The study was not high risk in terms of bringing harm to the participants, except for the potential for psychological stress due to recalling flooding experiences. The researcher was well aware of this fact and made sure to approach the questions on flood impacts in a sensitive and compassionate manner. Since this information was not central to the aim of the study, these questions were kept to a minimum and just asked in order to gain contextual understanding. Throughout data collection, there were no recorded instances in which participants became upset or emotional. Furthermore, only participants older than 18 years of age were included in the study.

All research participants were informed in detail about the study aims and how the data would be used. Furthermore, consent was obtained, either in a written or verbal form. It was clearly pointed out to participants that they had an option to stop their participation at any point. In order to avoid deception and raise false expectations, a special emphasis was placed on pointing out the nature of the study (i.e. academic). Moreover, all the answers were anonymised, so that information could not be traced back to a specific participant. Finally, in the case of taking photographic evidence that involved people, they were asked for permission.

The knowledge produced through qualitative research cannot be separated from the author (Creswell 2014), as one brings one's own set of values, biases, beliefs, personal background, and experiences that shape the research process (Berger 2015). In qualitative research, these aspects are made explicit through the concept of reflexivity, that elaborates what the researcher brings to the assignments and how this influences and transforms the research process (Finlay 2002).

Taking the reflexivity into account, there are two important aspects to enclose in order to understand how they might have influenced the research. Firstly, the researcher's educational background in civil and water engineering meant being trained in favouring technical solutions to FRM. However, influenced by readings during postgraduate studies in flood risk management, most notably O'Keefe et al. (1976) and Vojinovic and Abbot (2012), a conscious decision was made to pursue doctoral studies in a topic that approaches flooding from a more holistic perspective. Furthermore, qualitative research methodology courses at Heriot-Watt University were followed in order to become familiarised with the methodological details of the social sciences and a week-long course on facilitation of group discussions during the first year of his studies was attended.

Secondly, the researcher is coming from a country and culture very different to Malawian culture and did not speak any of the local languages. This was mediated by hiring Malawian research assistants that were constantly consulted in order to ensure that the researcher was sensitive about cultural customs. All the questions used during the FGDs and interviews with local communities were cross-checked for cultural appropriateness with Malawian researchers. Furthermore, local codes of behaviours (e.g. the choice of clothing, taking part in prayers, first greeting the local chiefs) were followed when in the villages. The research was conducted in a setting unknown to the researcher and on a

topic that the researcher has no direct experience with (i.e. never been directly exposed to a flood); however, this unfamiliarity has a potential to result in looking at the problem from a fresh viewpoint and coming up with innovative ideas (Berger 2015).

Throughout the fieldwork, the researcher was aware of the power relations between the researcher and research participants (Merriam et al. 2001). This discrepancy was especially evident at community levels since the researcher was a Western academic and an ‘outsider’ to local people. This was mediated by explaining in detail the aim of researcher’s presence in the villages and giving multiple opportunities to ask questions to the researcher. Local people had the power to decide what information to disclose (Karnieli-Miller et al. 2009). Sometimes, in a research setting where power differences are unequal, there is a concern of research participants giving answers that they expect the researcher to hear (Lavers 2007). Although possible that it happened in certain instances, it was felt by the researcher that overall, this was not deemed to be a case during data collection activities, and effort was made to phrase questions about a certain topic from different aspects, in order to gain a more comprehensive understanding. The present research was conducted with an underlying idea of giving power to local people to express their views on flooding and the ways it is managed in their localities. Moreover, the topic of LK was approached from a perspective of giving an opportunity to knowledge holders to create their narrative of LK use and usefulness.

3.5 Introducing the Lower Shire Valley: Nsanje and Chikwawa

The geographical focus of the present study was the Lower Shire Valley, located in the very south of the country and composed of the Chikwawa and Nsanje districts (Figure 3.1). The main reasons for focusing the investigation on this area were the: i) fact that Chikwawa and Nsanje are the most flood-prone areas in Malawi, ii) high concentration of development partners implementing CBFMR projects in communities, and iii) existing contacts in the districts that facilitated the access to the field.

3.5.1 Background information on the districts

Chikwawa and Nsanje form an area of approximately 6700 km² (Chidanti-Malunga 2011). According to the preliminary census data from 2018, Chikwawa has a population of approximately 564.684 (51% female, 49% male) and Nsanje of 299.168 (52% female, 48% male), with population density of 154 and 116 people per square kilometre in Nsanje and Chikwawa, respectively (National Statistical Office 2018). The population is young, with 51% and 52.9% of the population below the age of 18 in Chikwawa and Nsanje,

respectively (*ibid*). Approximately 80% of the population lives below the poverty line, exceeding the national average of 50.7% (Mwale 2015, citing the National Statistical Office 2012). Literacy rates in the districts are low, with the latest data indicating the literacy rate for population aged 15 years and above at 59.9% for Chikwawa and 58.1% for Nsanje (National Statistical Office 2017).

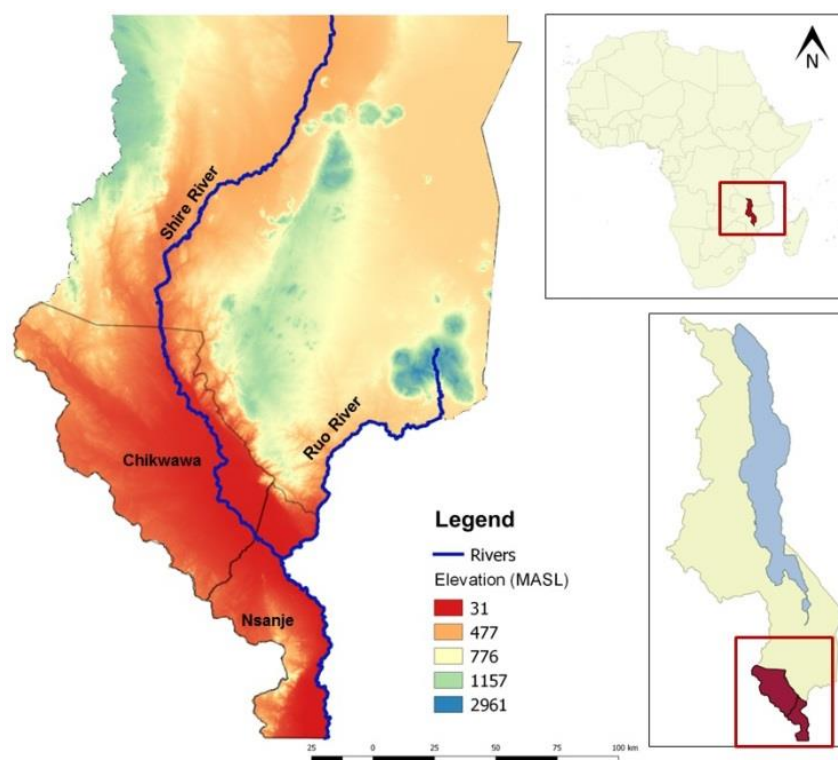


Figure 3.1 Geographical location of the case study area (source of GIS data: Malawi Spatial Data Platform¹² and United States Geological Survey¹³)

Chikwawa and Nsanje experience a number of development challenges. These include food insecurity; child and maternal morbidity and mortality; low income levels; environmental degradation; low accessibility to safe water and sanitation; high prevalence of HIV and AIDS; poor urban planning; frequent occurrence of disasters; unsustainable technologies and projects; poor accessibility, transport, energy and communication infrastructure; inadequate institutional capacity for service delivery; poor governance and community participation; poor livestock management; rise in crime; and, poor resources for local government (Nsanje District Council 2011, Chikwawa District Council 2017).

Smallholder subsistence farming is the major occupation of a majority of people in the districts. The percentage of households engaged in agricultural activities is 85.7 % for

¹² <http://www.masdap.mw>

¹³ <https://earthexplorer.usgs.gov/>

Chikwawa and 89.3 % for Nsanje, with maize, pigeon peas, nuts, beans, soya beans, sorghum, and rice being the main crops, and average cultivated area in acres being 1.7 in Chikwawa and 1.3 in Nsanje (National Statistical Office 2017). Agriculture accounts for over 80% of the economic sector in both districts (Nsanje District Council 2009, Chikwawa District Council 2017). Such a high reliance on subsistence farming has a direct link with flood vulnerability. As found by Nillson et al. (2010) and confirmed by Chawawa (2018), in order to farm and support livestock and fisheries, people settle in marginalised areas adjacent to river banks, where the soils are fertile. Communities in the Lower Shire Valley lack economic resources and employment opportunities (Mwale et al. 2015).

3.5.2 Flooding in the districts

In the districts, floods, dry spells, and droughts, among other hazards, present a serious threat to people's livelihoods and affect income generated by rain-fed agriculture. With Chikwawa and Nsanje being the poorest districts in the country, the combined effects of floods, dry spells, and droughts perpetuate the disaster-poverty cycle. Out of the proportion of the population that reported not having enough food in the 12 months preceding the 4th Integrated Household Survey, 45.1%, and 96.5%, in Chikwawa and Nsanje, respectively, reported that it is due to drought, poor rains, floods or water logging (National Statistical Office 2017).

Severe flooding occurred in 1942, 1956, 1997, 2001, 2002, 2003, 2005, 2006, 2012, 2015 (Lumumba Mijoni and Izadkhah 2009, Chikwawa District Council 2014, Rudari et al. 2016) and more recently, in March 2019 during Cyclone Idai. In addition to major events, annual flooding episodes are estimated to affect up to 100 and 500 households in Chikwawa and Nsanje respectively (Chikwawa District Council 2014, Nsanje District Council 2015). Mwale (2014), based on Atkins (2011), reports that 40% of the population in Chikwawa and 90% in Nsanje is affected by floods. Figure 3.2 gives an overview of the flood risk based on historical analysis¹⁴. Based on the hydrodynamic modelling, Adeloye et al. (2015) estimated that flood hazardousness in the valley falls into medium to high categories. However, the model used likely underestimated the hazard, since it

¹⁴ A detailed explanation of the methodology for Community Risk Assessment, developed by the 510 Data Team of the Netherlands Red Cross can be found here: <https://www.510.global/community-risk-assessment/>

modelled only the behaviour of the main rivers, without including tributaries that flash flood (Mwale 2014).

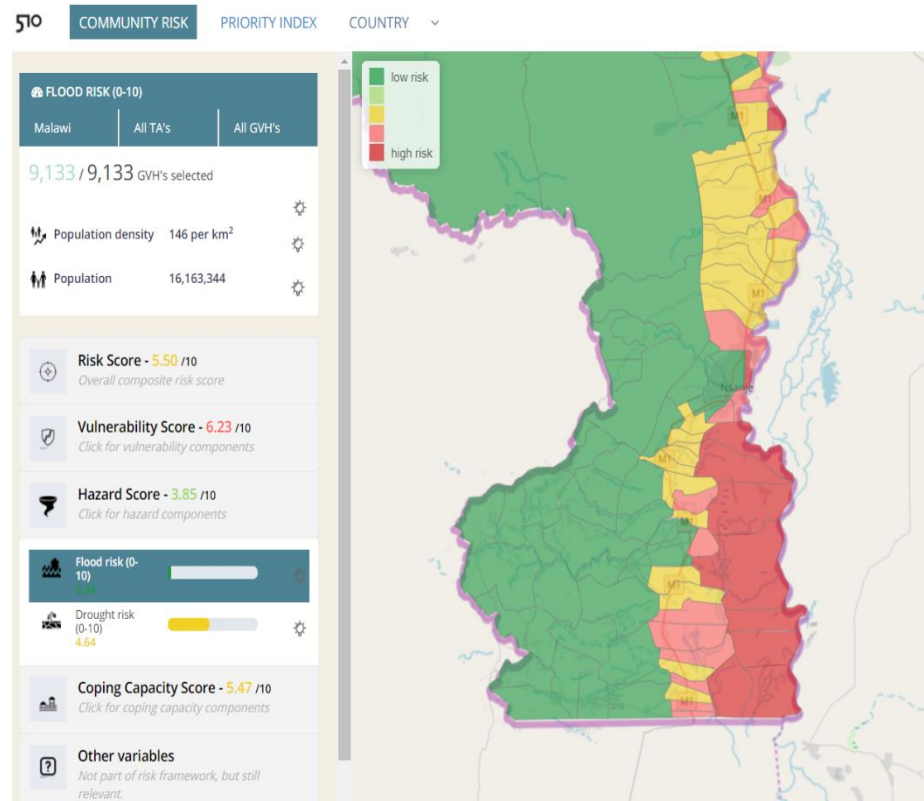


Figure 3.2 Overview of the flood risk in Nsanje and Chikwawa (source: 510 Dashboard, adopted from Šakić Trogrlić and van den Homberg 2018)

The hydrology of the Lower Shire Valley is dominated by the Shire River, the only outlet of Lake Malawi. Flooding in the region tends to be caused by flooding of the Shire River itself, flash flooding of the Ruo River and other smaller streams and backwater effects from the Ruo River joining the Shire River (Nillson et al. 2010, Atkins 2011). The average annual flow of the Shire is 450 m³/s and of the Ruo is 54 m³/s, with recorded flows as high as 1430 m³/s and 5400 m³/s respectively (Mwale et al. 2015). The rainfall in the Lower Shire Valley is relatively low, ranging between 400-700 mm annually (Phiri and Saka 2008). However, due to its low-lying position, the Valley receives runoff generated by rainfall in the catchments in the upper and middle Shire Basin (Mwale 2014). Hence, flooding in the Lower Shire Valley is connected with rainfall from the upper districts, further exacerbated by environmental degradation (Shela et al. 2008). As in rest of Malawi, rainfall occurs between November and April. However, as reported by Mwale (2014), 90% of rainfall is received between December and March.

Floods bring severe, cascading consequences in the Lower Shire Valley. They destroy houses and crops, cause loss of life, wash-away livestock, and present a threat to public health through cholera and malaria outbreaks (Lumumba Mijoni and Izadkhah 2009). Furthermore, they destroy the infrastructure (e.g. roads, irrigation schemes, water boreholes) (Shela et al. 2008). Moreover, floods affect social infrastructure by interrupting the work of hospitals and schools (*ibid.*). Additionally, floods cause internal displacement of the affected population.

3.6 Overview of fieldwork

In this section, a detail account of the fieldwork conducted in Malawi will be presented.

3.6.1 Three stages of fieldwork

This thesis is based on data collected during three periods of fieldwork (Figure 3.3). During different stages of fieldwork, FGDs, key informant interviews (KIIs), direct observations through field visits were conducted, various documents were collected, and interaction was made with different stakeholder groups (i.e. local communities, NGOs, local and national government, FRM consultants).

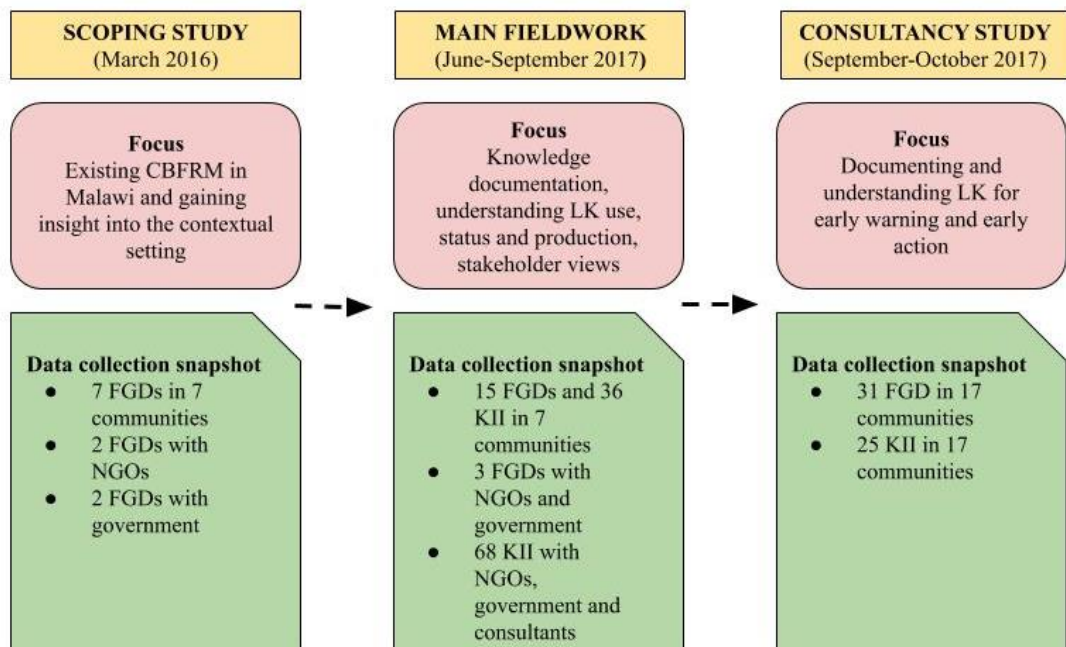


Figure 3.3 Overview of fieldwork stages

The scoping study was an opportunity to get familiarised with the case study and refine the research focus and methods used in the study. Prior to commencing the scoping study, the research focus was exclusively on CBFRM. However, after interacting with

participants in the field, it became apparent that LK presents a significant component of local-level FRM; yet, its role and current status remains unclear and under researched. In addition, it was unclear how this knowledge interacts with the wider CBFRM system. Therefore, after summarising the work conducted during the scoping study, a decision was made to further research this knowledge, with an assumption that insights provided could contribute to the sustainability of FRM activities in the Lower Shire Valley. Upon refining the aims and objectives, the preparations for the main fieldwork were done. From June to September 2017, intensive fieldwork was done, which forms the core of the findings presented in this thesis.

While collecting data during the main fieldwork, a connection with the individuals from Malawi Red Cross Society (MRCS) and 510 Global from the Netherlands Red Cross was made. During that time, these stakeholders were in the process of implementing a project entitled *Enhancing resilience of vulnerable communities and building institutional disaster response capacity in Phalombe, Thyolo, Chikwawa, and Nsanje* and funded by the European Civil Protection and Humanitarian Aid Operations (EU ECHO). One of the project objectives was to strengthen Early Warning/Early Action capacity, with a sub-objective of conducting a study and documenting indigenous early warning systems for floods, droughts, and dry spells. Based on the scope of the present PhD study, the researcher was offered the role of a lead consultant for conducting the study, together with a Scientific Lead from 510 Global.

The consultancy study aimed to explore: 1) what local early warning signs for floods, droughts, and dry spells are observed by communities, 2) how are these signs being disseminated and 3) if any early action is taken by communities. The researcher was in charge of designing the complete methodology and research instruments for the study, conducting the literature review and was in charge of data analysis and results in the write-up for the part of the study related to the hazard of floods. The study findings were published in the form of a report entitled *Indigenous knowledge and early warnings systems in the Lower Shire Valley in Malawi* (Šakić Trogrlić and van den Homberg 2018).

In terms of the research presented in this dissertation, data collected through this consultancy assignment was used as an additional source of data for further understanding local-level early warning systems and the type of actions taken by communities. Furthermore, it provided an opportunity to qualitatively assess the spatial dimension of

locally available knowledge. It is, however, important to emphasise that the scoping study and main fieldwork were much wider in scope and as such present the main source of findings presented in this research. Throughout this section, a detailed account of fieldwork activities will be provided.

3.6.2 Gaining research permission in Malawi

The whole project was conducted with a joint supervision by an academic from the Polytechnic Blantyre, a part of the University of Malawi. Upon arrival in Malawi, the researcher made contact with DRR officers in Nsanje in Chikwawa and explained the aims of the research and provisional fieldwork plan. Upon meeting with local government officers, permission for research was granted by the District Officer (Appendix 1). Furthermore, local government officers made contact with Senior Chiefs in the respective Traditional Authorities (TAs) where the research was about to take place, who also granted permission for conducting research. Finally, the permission of village chiefs was also sought. For the consulting assignment, no separate permission was needed, as the study was a part of an ongoing project approved by the District Executive Council.

3.6.3 Research assistants

Four research assistants (RAs) were employed (three male and one female), two of whom were involved both in the scoping trip and during the main period of fieldwork. In both occasions, separate training meetings with RAs were organised, in order to explain to them the objectives of the study and get them accustomed to the questions to be asked during FGDs and KIIs.

During the scoping study, RAs were members of the local government, both experienced in interacting with and mobilising local communities and educated to university level. In Chikwawa, the RA was a government official working with local communities through the Social Cash Transfer Programme. In Nsanje, the RA was a member of the District Civil Protection Committee (DCPC) with a rich, long-term experience of working on the issues of DRR with local communities, including the communities visited throughout this fieldwork. During the scoping study, additional assistance with FGD facilitation was provided by the researcher's Malawian supervisor (a female academic specialising in the topic of FRM).

During the main period of fieldwork, the main RA was a female Malawian student, specialising in water resources management. The choice of selecting a female RA was

made in line with recommendations from Malawian colleagues, in order to make female research participants more comfortable during FGDs and KIIs. RA responsibilities involved the facilitation of the majority of FGDs and KIIs and direct translation. An additional RA, the local DRR Officer, was employed in Nsanje, due to his rich knowledge of the topic and long-lasting experience of working with communities.

For the consultancy study, facilitators were from the Malawi Red Cross Society (MRCS), and were both male and female, and had extensive experience in interacting with communities. All were trained in an online session, where the details of the study were presented and questions discussed. In each of the case study areas, there was a team of two facilitators. All the RAs in this study were managed by senior staff members from MRCS, and a WhatsApp group was formed as a way to foster fast and efficient communication between facilitators and the researcher.

3.6.4 Choice of case study areas

Large parts of the Lower Shire Valley are exposed to annual and extreme flooding, leaving a variety of options for the selection of possible case study areas. The study involved multiple locations, on the administrative level of group village (GV) (i.e. the lowest administrative level in Malawi composed of several villages). Number of GVs in which the study was conducted was determined based on what was practically achievable considering available timeframe and budget. In total, data were collected in 26 group villages. The overview of the case studies and the number of participants in each of the case studies is presented in Appendix 2. The geographical location¹⁵ of the visited areas for the main fieldwork and consultancy assignment is presented in Figure 3.4.

During the scoping study, case study areas were chosen in consultation with local disaster officers. In order to gain an understanding of the flooding problems and understand approaches taken to manage and reduce risks, villages that were exposed to frequent flooding, as well as being beneficiaries of the CBFRM project were chosen. As a result, data were collected from seven group villages.

¹⁵ During the scoping study, no geographical coordinates were recorded.

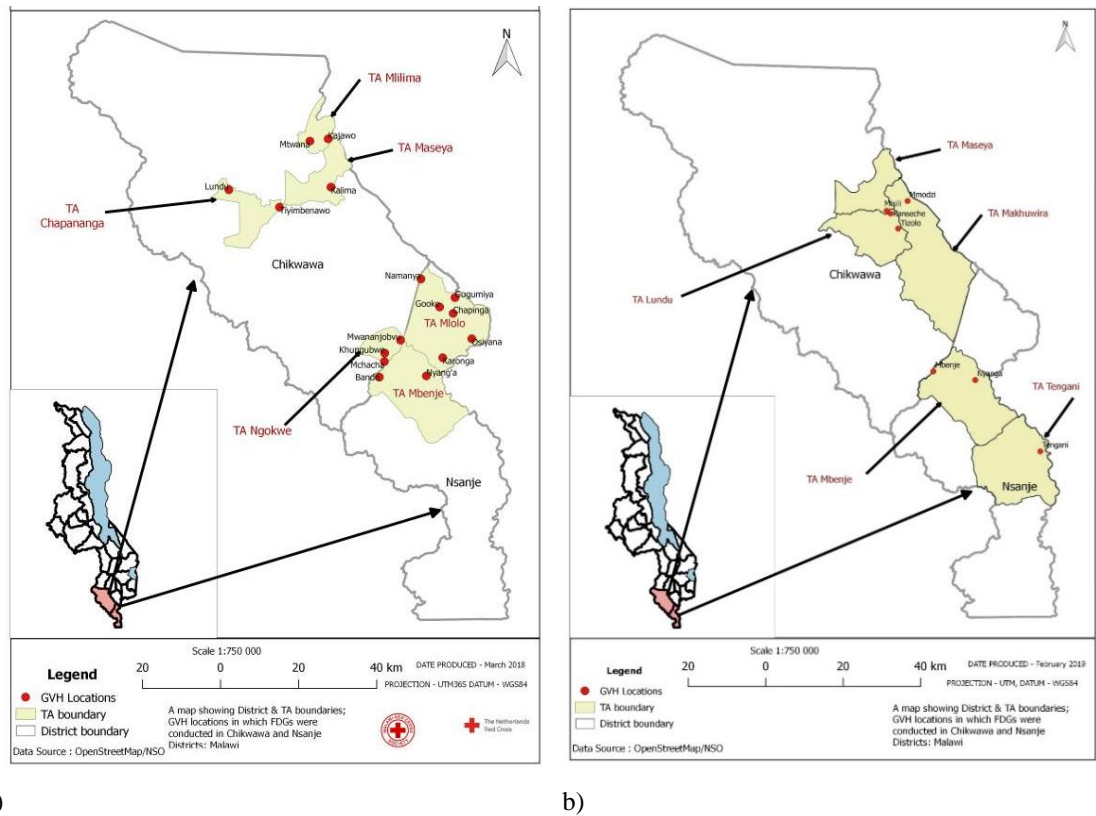


Figure 3.4 Geographical location of case study areas where the consultancy assignment (a) and the main fieldwork (b) were conducted (adopted from Šakić Trogrlić and van den Homberg 2018 and Šakić Trogrlić et al. 2019, respectively)

Selection of the case study areas for the main fieldwork was based on a process presented in Figure 3.5, and included the following:

- Before going to Malawi, a list of case study options was created based on the available data sources: i) inputs collected through a stakeholder survey with members of NGOs and local government during the scoping study in Malawi in 2016; ii) areas designated as flood-prone in the Contingency plans for Chikwawa and Nsanje Districts; iii) findings from previously conducted studies (Mwale 2014); and consultation with a researcher working on the topic of political ecology of flooding in Nsanje District (Chawawa 2018). The list of options created was at the TA level, which was a rather large spatial scale for the study, but it served as a starting point for discussions with local stakeholders in the field.
- Upon arrival in Malawi, consultations with FRM consultants involved in the Shire River Basin Management Project were conducted. As a part of the project, the consultants were co-developing Area and Village Level Flood Action Plans with local communities exposed to frequent and extreme flooding. The choice of the case studies was made based upon consultations. The initial list was then further

discussed with a DRR officer in Nsanje and a member of the local government in Chikwawa, in order to reach a joint decision.

- Finally, six case study areas (three per district) were selected, with an additional case study where a pilot FGD was conducted.

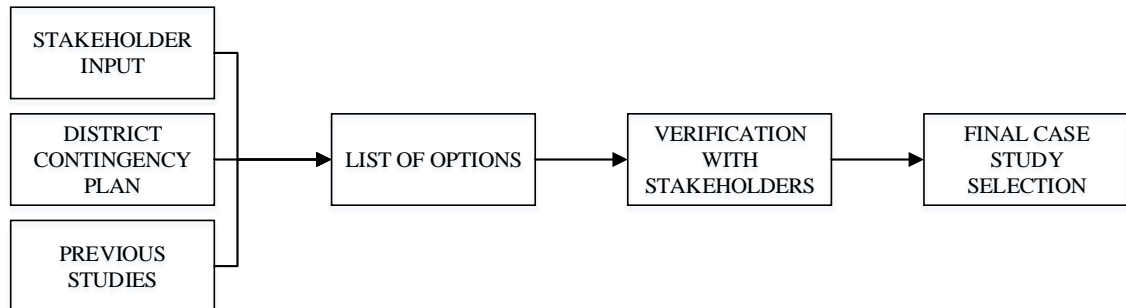


Figure 3.5 Process for selecting case studies for the main period of fieldwork

The case study areas for the consultancy assignment were preselected by the Red Cross, as these were part of an already ongoing project. The project was focused on GVs of lower development status and geographically linked case studies (i.e. following the course of the same river). This included 17 GVs (8 in Chikwawa and 9 in Nsanje) across six TAs (4 in Chikwawa and 2 in Nsanje).

In all case studies, problems occur both due to riverine flooding and flash flooding, occurring on an annual basis; but not simultaneously in all communities under investigation. Furthermore, flood impacts will differ on a year-to-year basis. In some years, only the fields will be flooded, which is in general perceived as beneficial, given the appropriate timing and extent of flooding, due to residual moisture used for farming. In some other years, houses and household items will be severely affected. Among the selected case studies, riverine flooding presents a major problem in some communities (e.g. Tizola, Kanseche, Misili, and Mbenje), whereas flash flooding is a more major problem in others (e.g. Mmodzi, Tengani, Nyanga). However, it is impossible to draw a clear distinction between different types of flooding experienced by study participants, due to the spatial unit of analysis (i.e. GV rather than village level) and sampling strategy employed, as will be explained in the following sections.

3.6.5 Overview of different stakeholder groups included in the research

In order to understand the role of LK in CBFRM, it was necessary to gather inputs not just from the communities living in the flood-prone areas but also from governmental and

NGO sectors, since these play an important role in CBFRM planning and implementation. Therefore, these stakeholder groups were of core interest since the early stages of research development. In addition, interviews with several FRM consultants (both national and international) based in Malawi were conducted.

Where possible, participants from the government and NGOs were recruited both from the district (i.e. Nsanje and Chikwawa) and national levels. For instance, members of a certain ministry at the national level were interviewed, but also their staff at district levels. In total, participants came from ten different ministries. The same approach was taken with NGOs: many NGOs involved in CBDRR work in Malawi have both national offices and offices in Nsanje and Chikwawa. Therefore, whenever possible, both of these were approached. Participants representing the NGOs came from 12 different international NGOs and 11 different national NGOs. Since it was not deemed as an important parameter in terms of the research topic, data were not collected on the type of the NGOs (i.e. humanitarian, development, environmental).

An overview of the numbers of interview respondents and FGDs from NGOs, government and consultants is presented in Table 3.2. As can be seen, 28 interviews with governmental stakeholders (18 at district and 10 at the national level), 36 interviews with NGOs (21 at district and 15 at national level), and four interviews with FRM consultants were conducted. In total, this makes for 68 interviews. In addition, seven FGDs were conducted with the members of NGOs (n=4) and local government (n=3) in Nsanje and Chikwawa.

Table 3.2 Overview of interviews and FGDs with government, NGOs and FRM consultants at district and national levels

| | | District level | | | National level |
|-------------------------|-----------------|----------------|-----------------|-----------------|----------------|
| | | <i>Nsanje</i> | <i>Chikwawa</i> | Total | |
| Interviews | Government | 13 | 5 | 18 | 10 |
| | NGOs | 11 | 10 | 21 | 15 |
| | FRM consultants | | | | 4 |
| Focus group discussions | | <i>Nsanje</i> | | <i>Chikwawa</i> | |
| | Government | 1 | | 2 | |
| | NGOs | 3 | | 1 | |

Participants from the local communities formed the largest group interacted with. In total, across three different stages of fieldwork, 53 FGDs were held in 26 communities (372

participants¹⁶, including 171 female and 201 male). Additionally, 61 KII were conducted¹⁷ (23 male, 13 female, and gender not known for 25 participants¹⁸). A detailed breakdown of FGDs and KIIs with communities across three stages of the fieldwork is provided in Appendix 2. The selection of participants from each of the stakeholder groups was based on a sampling approach described in the following section.

3.6.6 Sampling and selection of research participants

Qualitative sampling follows no rigidly prescribed procedures (Coyne 1997), and the researcher chooses the study participants based on whether their experiences, knowledge, and the information they can provide are in line with research goals in mind (Sandelowski 1995, Bryman 2012). Since central to the aims of this research was to involve people that have experience with flooding and are involved in CBFRM in Malawi, the study used the nonprobabilistic sampling procedures. Three approaches were used: purposive, opportunistic and snowball sampling.

Purposive sampling involves selection of participants directly relevant to research aims based on a set of criteria in order to obtain in-depth information related to the phenomenon of interest (Bryman 2012). Unlike theoretical qualitative sampling, aimed at developing new theories, purposive sampling is concerned with providing insights from a real-life setting (i.e. the field) (Flick 2018). It is commonly employed in qualitative research since it provides rich information ‘*within a specific location, context and time*’ (Gray 2018, p.173). In the present research, purposive sampling was a predominant sampling approach and was used for identifying participants representing different stakeholder groups (Table 3.3). Purposive sampling was used to select both case studies (as explained in Section 3.6.4) and research participants.

Opportunistic sampling is an approach where a researcher capitalises on an opportunity to collect the data upon encountering participant that can have valuable knowledge about the topic of inquiry (Bryman and Bell 2015). This approach was used in rare occasions while recruiting NGO participants and participants from the local government. For instance, during a lunch break in Nsanje in April 2016 the researcher came across three staff members from a local NGO implementing a disaster resilience project with local

¹⁶ During the consultancy study, in 9/31 conducted FGDs, research assistants did not record the number of participants; hence, the final number of participants in FGDs is higher than the number presented herein.

¹⁷ In GVH Kanseche, KIIs were conducted as a group interviews with elderly men and elderly women, separately.

¹⁸ The data on the gender of KII participants in the consultancy study was not recorded by facilitators.

communities. Furthermore, some of the interviewees from the local government in Nsanje were interviewed during a two-day training workshop (organised by an NGO) for the members of the district government, since this presented an opportunity to approach the individuals of interest.

Table 3.3 Criteria used for purposive sampling in different fieldwork stages

| | Communities | NGO/government | FRM consultants |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Scoping study | <ul style="list-style-type: none"> - communities affected by flooding - beneficiaries of CBFRM projects | <ul style="list-style-type: none"> - NGOs implementing DRR related projects in communities - government departments involved in District Civil Protection Committee | - |
| Main fieldwork | <p>Participants for FGDs selected based on the following criteria:</p> <ul style="list-style-type: none"> - over 18 years of age - living in the community for a longer period of time (preferably longer than 20 years) - experience with flooding - living or farming in the low-lying, flood-prone areas <p>Participants for KIIs selected based on the same criteria. Additionally, in order to gather perspectives on LK from a wider community representation, interviewees included local leaders, youth/elderly representatives, farmers, religious leaders, and governmental extension workers.</p> | <ul style="list-style-type: none"> - (I)NGOs implementing DRR related projects in communities (district and national level) - government departments involved in District Civil Protection Committee (district level) - government departments involved in DRR-related work (national level) | Involved in FRM work at the community level. |
| Consultancy study | The criteria were the same as during the main fieldwork. The difference was that the focus was on elderly participants. | - | - |

The premise in snowball sampling is that the researcher starts with initial interviewees, who then recommend to the researcher further participants that would be of interest for the study (Bryman 2012). The approach proved very useful in recruiting the participants from NGOs and government, both at the local and national level. For the national level, prior to going to Malawi, several individuals who recommended and provided contact details of possible interviewees were reached out to. Once when in Malawi, at the end of each interview, participants were asked to recommend further interviewees from their or any other organisation. It often happened that participants from the national level pointed researcher in the direction of interviewees to be contacted in respective districts.

An important aspect to consider was sample size, which is challenging to determine in qualitative research (Bryman 2012, Saunders et al. 2018). In this study, data saturation was used as a criterion for determining the sample size. As explained by Guest et al. (2006), data saturation means that further interviews or FGDs yield very little or no new insights. In other words, no new information is forthcoming (Galvin 2015). There is a lack of consensus about at what exact point this occurs. For interviews, it was reported that saturation occurs within twelve interviews (Guest et al. 2006), while for FGDs 90% of themes identified through data analysis occur within three to six FGDs (Guest et al. 2017). Towards the end of data collection, it was noted that no new and significant information was being shared. Similarly, during the data analysis, as the coding process (Section 3.7) was progressing, it was found that no further codes were emerging.

3.6.7 Overview of the questions in the interviews and focus group discussions

As previously mentioned, semi-structured KIIs and FGDs were the main methodological instruments used for data collection in this study, and in order to successfully conduct them, there was a need to prepare an interview and FGD discussion guides. A detailed list of questions asked during FGDs and KIIs is provided in Appendix 3, while the main themes covered during different periods of fieldwork are presented in Table 3.4.

3.6.8 Conducting FGDs and interviews with the communities

Prior to arriving at the case study areas, RAs contacted local chiefs in order to organise the logistics (e.g. arranging the time of the arrival and a place where FGDs and KIIs are to take place). Chiefs were instrumental in assisting with the selection of research participants. RAs explained the profile of participants needed for the study. For the scoping study, this was straightforward, since research team wanted to meet the members of the Village Civil Protection Committees (VCPCs), whereas, for the main study and consultancy study, the criteria were designed in a greater detail (see Table 3.3).

Upon arriving to the villages, the research team first met with the chiefs, where a further elaboration on the study aims was given and it was checked whether the chiefs had managed to reach out to potential participants that met the research sampling criteria. In all the case studies, chiefs had previous experience of interacting with researchers and development workers. The research team then proceeded to conduct the FGDs and KIIs.

Table 3.4 Main themes discussed with different stakeholder groups during fieldwork

| | Communities | NGOs | Government |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Scoping study | <ul style="list-style-type: none"> - Recent flooding events and their impacts - Flood-related projects in communities - Community participation in projects - Perceptions of project effectiveness - A way forward for FRM | <ul style="list-style-type: none"> - Role of NGOs in FRM - Setup and type of CBFRM projects - Community participation in projects - Challenges for CBFRM - A way forward for FRM | <ul style="list-style-type: none"> - Role of local government in FRM - Setup and types of CBFRM projects - Community participation in projects - Challenges of CB-FRM - A way forward for FRM |
| Main fieldwork | <ul style="list-style-type: none"> - General information about flooding in a respective community - LK for FRM (before, during and after) - Status of LK (now and in the past) - Creation, holders, and transmission of LK - Perception of LK - LK and outsiders - Barriers for LK and enhancement of use | <ul style="list-style-type: none"> - Flood-related works in communities - Setup and challenges for CBFRM - General understanding of LK - Use of LK - Perception of LK - Barriers and opportunities for LK | <ul style="list-style-type: none"> - Sectoral roles in FRM - Legal, policy and institutional setup for FRM - Setup and challenges for CBFRM - General understanding of LK - Use of LK - Perception of LK - Barriers and opportunities for LK |
| Consultancy study | <ul style="list-style-type: none"> - Overview of the flooding situation in the community - Local early warning signs - Systems for signs sharing - Early action - Reliability of local signs - Accessibility to official early warning | - | - |

Prior to commencing the FGDs and KIIs, the members of the research team introduced themselves and the research. Participants also introduced themselves. In many cases, following the local customs, prior to the FGDs, a participant would say a prayer. Thereafter, the aims and nature of the visit were explained to the participants. It was extremely important at this point to explain that the data are being collected as a part of an academic study, and people will receive no direct benefits (e.g. new development or DRR projects in their communities). This was done in order to avoid raising expectations from the participants and creating false promises, and it was deemed appropriate in a

setting such as the Lower Shire Valley, where communities are exposed to a number of development projects. This process served as gaining informed consent. The advice from Malawian colleagues was that gaining consent by asking people in the communities to sign a paper would be seen as suspicious. In addition, the illiteracy rates are high in Nsanje and Chikwawa, so the researcher wanted to avoid putting the participants in an uneasy position. At this point, participants were also encouraged to ask any questions that they might have and actively participate in the discussions.

During the main fieldwork and consultancy study, FGDs were gender-separated. This was deemed appropriate based on the experiences from the scoping study when an observation was made that female participants were reluctant to openly speak in the presence of male participants.

FGDs and KIIs were conducted in Chichewa, with some exceptions (e.g. parts of FGDs and KIIs in Sena, a local language in Nsanje, and two KII with community members conducted in English). Although RAs served as primary facilitators, the questions were asked by the researcher, and then translated into the local language, using previously translated question guides. The follow-up questions were translated on the spot. A direct translation was provided by RAs. FGDs were on average two hours in duration, while KIIs lasted between 25-60 minutes. All the FGDs and KIIs were recorded, upon gaining permission from the participants.

An effort was made to cover all the questions from FGD and interview guides. However, this was not always possible, and in these cases, a decision was made to cover the crucial questions. In some instances, certain topics sparked more interest from participants and opened an opportunity to share valuable insights; hence, this deviation from the designed guides was beneficial. Overall, people in FGDs and KIIs were extremely welcoming and happy to share their insights and thoughts on the topic.

Questions for FGDs and KIIs were constantly revisited during the scoping study and the main fieldwork. Based on the experience and upon seeing how people react to the questions, some questions were modified, and in some instances, new questions were added. Prior to starting the main fieldwork, a pilot FGD was held in Tizola in Chikwawa.

It was noticed that questions were generally well understood; hence, only minor adjustments were made.

3.6.9 Conducting FGDs and interviews with the government and NGOs

Interviews with the government and NGOs took place in the Lower Shire Valley, Blantyre, and Lilongwe. In the Lower Shire, the interviews and FGDs were conducted with NGOs present in the districts and with members of local government. In Lilongwe and Blantyre, interviews with participants from the national government and national offices of NGOs were conducted. Duration of the interviews was in the range from 30-120 minutes (approximate average duration of one hour), while FGDs took 90 minutes. All the interviews and FGDs were conducted in English¹⁹. In most instances, they took place in the offices of respective interviewees, or in the case of FGDs, in a meeting venue located at District Offices.

Prior to commencing with the interviews and FGDs, the aims of the projects and how the data will be used were explained to participants. As a part of the introduction, informed consent was asked for, either in the case of a verbal confirmation (in the districts) or in a written form (at national levels). Again, the advice from RAs was followed, who suggested that at district levels, asking participants to sign a document would be seen as too formal and suspicious, and could hence influence the content of information to be shared. For the national level, this was not deemed the case. An example of a form used for informed consent is presented in Appendix 4. Participants were also asked for the interviews and FGDs to be recorded, and the permission was granted in all cases except one, where detailed notes were taken.

Similar to experiences of community-level data collection, it was not always possible to cover all the aspects included in the interview guides, due to time availability of a specific interviewee or exact background. In these circumstances, a decision was made to focus on the main aspects. Furthermore, questions were not always asked in the order presented in the interview guides, since the interviewee would naturally start talking about a certain aspect earlier than planned.

¹⁹ English is official language used in educational system in Malawi. Since all the participants from NGOs and government received education, the level of English was generally high. Therefore, there was no need for translation.

In addition to the interviews and FGDs, during a scoping study, a short survey (Appendix 5) was administered to FGD participants in Nsanje and Chikwawa, and it was completed by 30 individuals. The aim of this survey was to identify specific organisations (e.g. NGOs and government departments) which would be of interest for the study, to get an overview of the type of projects being implemented, to gather information on the possible case-study areas for the research. This information was used in selecting the final case study areas (Section 3.6.4).

3.6.10 Direct observations through field visits

While visiting different case studies for data collection activities, there was an opportunity to observe the surroundings and settings of these communities. In each of the visits, the researcher, accompanied by a local villager took a short walk in the village. These walks helped with understanding of the physical exposure to floods by observing the location of the village in relation to rivers causing the floods, observing the location of the fields, understanding differences in housing units, and observing some of the local methods villagers mentioned are used as a part of flood management in their village. Evidence was recorded in the form of photographs (Figure 3.6).

In addition to visits to case study areas, there was also an opportunity to accompany an international consultancy firm tasked with design and implementation of flood risk reduction infrastructure (e.g. dikes, drifts). It was a two-day routine visit to five construction sites (three in Chikwawa and two in Nsanje), examples of which are presented in Figure 3.7. In these construction sites, committees composed of the members of local communities were formed to oversee the implementation of the projects, and these committees were regularly interacting with the consultants. Besides these visits usefulness for the understanding of the flood management approach in the Lower Shire Valley, it was possible to gain further insights into challenges occurring during the project implementation. Furthermore, the team of consultants shared their knowledge of FRM system in the Lower Shire Valley by taking the researcher to several ‘off-route’ sites (e.g. the hydrometric scale in Mwanza River presented in Figure 3.7).

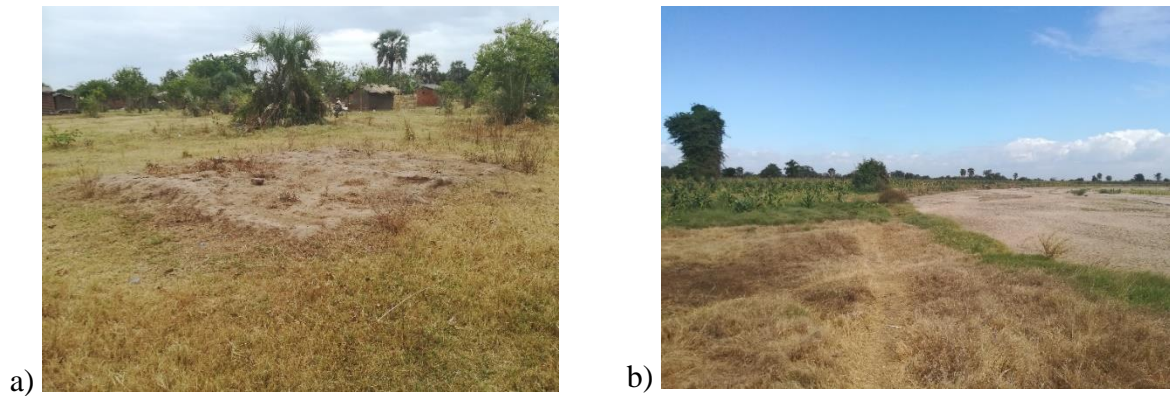


Figure 3.6 Some photographs from GVH Kanseche (Author's own, June 2017) : a) a place where a house collapsed during floods, and b) a location where Mwanza River breaks into the village



Figure 3.7 Photographs from field visits with consultants (author's own, June 2016): a) drift construction in GVH Gooke and b) hydrometric scale in Mwanza River

3.6.11 Collecting and using secondary data

During periods of fieldwork in Malawi, secondary data were gathered. This included various policy and legal documents, internal project reports and documents from different organisations (e.g. training materials for communities used by NGOs), and unpublished studies related to DRR. The majority of literature on FRM and DRR in general in Malawi is in the form of grey and unpublished literature that the researcher had no prior access to (e.g. not available online). Therefore, during interviews, participants were asked if they are in possession of documents that could assist in providing contextual understanding for the study. These data, when available, were useful for triangulating the findings with primary data collected through FGDs, interviews and direct observations. Some

documentation (e.g. local contingency plans) were also used to inform the sampling of the case study villages, as explained in Section 3.6.4.

3.6.12 Challenges encountered during fieldwork

Conducting fieldwork is not without challenges and is a reality of qualitative research. In order to ensure the transparency of the research process, it is important to disclose the difficulties encountered.

In Malawian culture, local chiefs play an important role. Although chiefs' approval and participation was instrumental for successful fieldwork, it was preferable for chiefs not to be present during FGD discussions, but rather to be interviewed as key informants. An assumption was that they might dominate the discussion and that fellow participants might be not comfortable with sharing their actual views and raising issues. However, this was not possible in all cases. For instance, in all the case studies in Chikwawa covered during the main fieldwork, after greeting the chiefs, as a first step of entering the village, they decided to stay for the discussion. Due to them being instrumental for conducting research at the community level, it was not an option to ask them to leave. Fortunately, in three out of four cases, chiefs did not dominate the discussion and upon observing the dynamics of conversation and also non-verbal communication by participants, the researcher concluded that presence of chiefs did not, in fact, influence the data collected. However, in one of the case studies, the local chief was quite dominant, and in few instances, he interrupted the other person talking or his non-verbal communication (e.g. eye contact) made it clear that participation by all the participants was not equal. This behaviour was noted and taken into account during the analysis of this specific transcript. In all the case study communities in Nsanje, chiefs were not present during discussions.

Although the general participation during FGDs was satisfactory, in some cases there was limited involvement of some of the participants. Upon observing this, an effort was made to mobilise the people by asking if they would have something to add or directing a question to these individuals in a subtle way (e.g. eye contact).

Another problem was access to documents that could serve as a source of secondary data for the study. In many cases, during the interviews, participants referred to potentially useful documents of previous studies done by their organisations. However, they could

not trace those documents and although follow-up e-mails were sent, some of the documents were never gathered.

Finally, since the researcher was not present in person during data collection activities for the consultancy study, some issues occurred. For instance, the RAs strictly followed the question guides, without asking follow-up questions in instances where respondents answer provided an opportunity for an interesting insight. Furthermore, the RAs did not collect the gender and age profile of the KIIs interviewed in this part. However, as previously explained, the use of data collected through this study was limited and only applies in specific parts of Chapter 5.

3.7 Data analysis

Qualitative research usually generates a large amount of data, making the analysis process intense, time-consuming and non-linear (Bazeley 2013). Often, qualitative researchers are criticised for not being explicit enough about the procedures followed while analysing their data (Bradley et al. 2007, Leech and Onwuegbuzie 2007). Therefore, this section will provide a detailed account of how data collected in the field were analysed.

3.7.1 Analysis of data collected through interviews and FGDs

The general procedure followed during the analysis of collected data is presented in Figure 3.8. All the FGDs and interviews (except for one) were recorded using an audio-recording device. The first step in preparing the data for the analysis was to transcribe the audio materials. The FGDs conducted with local communities were transcribed by research assistants and translated to English. Although detailed notes were taken during the discussions, the transcription was needed in order to maintain the richness of the data collected. FGDs with government and NGOs, as well as all the interviews conducted with community members were transcribed by the researcher. Although this was a very time-consuming process, it allowed the researcher to immerse himself in and gain a better understanding of the data. Transcription is often referred to as the first step in the qualitative analysis as it is an interpretative act involving a number of analytical decisions (e.g. what parts of audio material to transcribe) and resulting in new understandings (Bailey 2008).

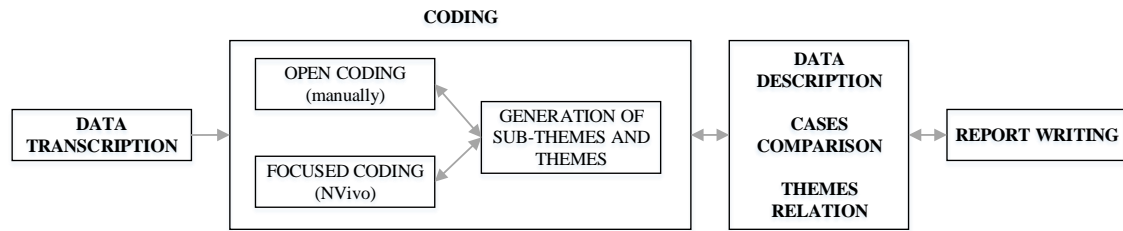


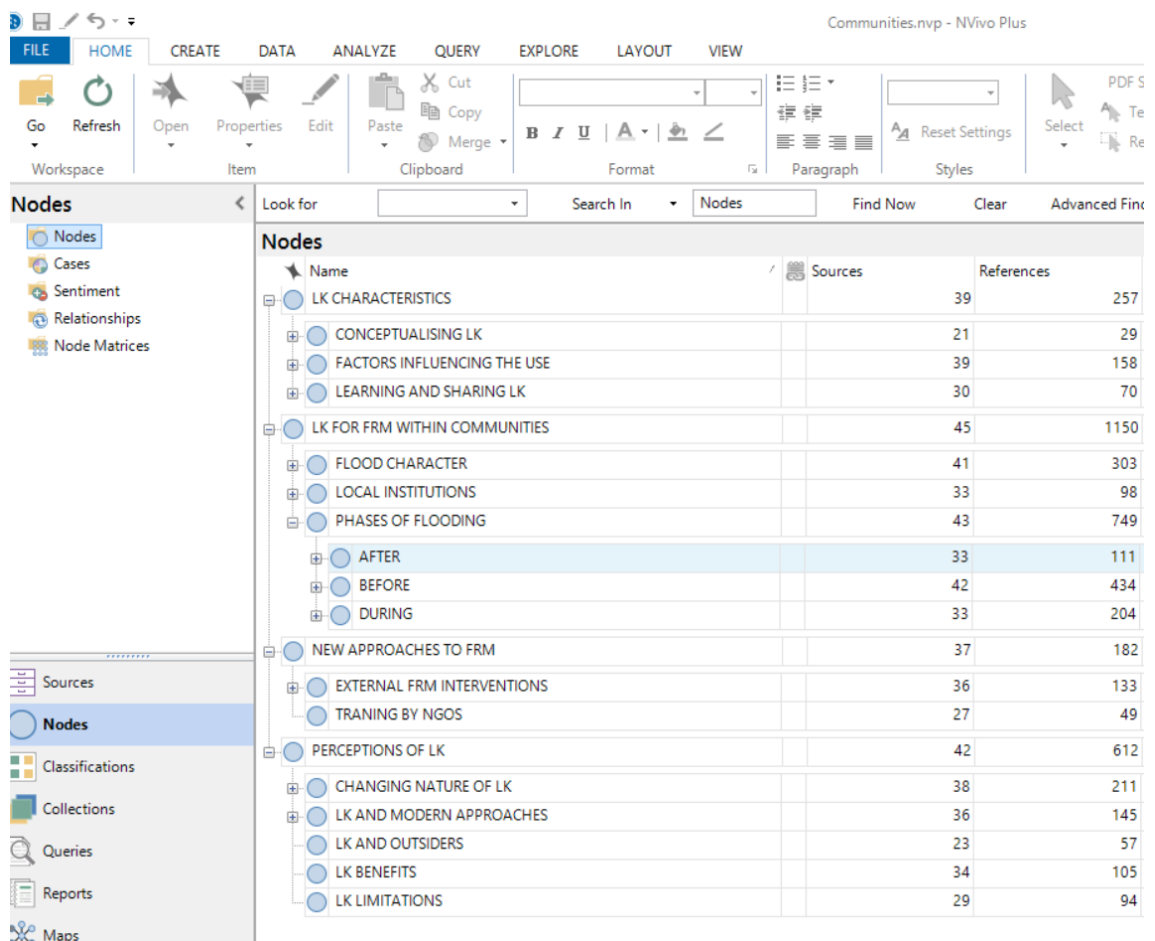
Figure 3.8 Schematic representation of the procedure used during data analysis

Upon transcribing the data, a process of coding started, generally referred to as a central activity in qualitative data analysis (Blaikie 2009). Coding involves attaching meaning to a piece of text (e.g. word, phrase, sentence, paragraph) (Miles and Huberman 1994). Coding is a step in data analysis where a researcher ‘*defines what is happening in the data and begins to grapple with what it means*’ (Charmaz 2014, p.113). It is an iterative process, constantly revised and revisited through analysis (Bryman 2012). Multiple codes are merged into themes and descriptions, where themes present major findings in qualitative studies and descriptions entail detailed accounts of people, places, and events (Creswell and Creswell 2018). In this study, primary data were analysed using thematic analysis, defined as ‘*a method for identifying, analysing and reporting patterns (themes) within data*’ (Braun and Clarke 2006, p.79). The approach to coding involved six steps: i) getting familiarised with the data, ii) generating initial codes, iii) searching for themes, iv) reviewing themes, v) defining and naming themes, and vi) producing the report (Braun and Clarke 2006).

The literature usually refers to two stages of the coding process, initial/open and focused (Bryman 2012, Charmaz 2014). The former refers to a phase in which meaning is assigned to a piece of text, whereas the latter is concerned with a more systematic and conceptual approach in which significant codes are synthesised and integrated (Charmaz 2014). The open coding in this research contained a process in which printed transcripts were coded with two types of codes. First, this included *a priori* codes- a short list of codes generated based on the questions covered during interviews and FGDs²⁰. However, the majority of codes emerged while reading the transcripts, since new and interesting horizons were emerging through peoples’ accounts that were not captured by a priori codes. The process of open coding resulted in a rather large number of codes. Once it was noticed that new codes were no longer emerging, the codes were reviewed and grouped

²⁰ A priori codes were employed to a greater extent while analysis the data from the consultancy assignment, since the focus of the study was much more narrow. Also, since the main fieldwork took place prior to consultancy study, the questions developed were much more focused.

into sub-themes and likewise sub-themes into themes. In parallel with doing the open coding, detailed notes were taken, reflecting on the development of codes and identifying the initial relation within the data.



| Name | Sources | References |
|-------------------------------|---------|------------|
| LK CHARACTERISTICS | 39 | 257 |
| CONCEPTUALISING LK | 21 | 29 |
| FACTORS INFLUENCING THE USE | 39 | 158 |
| LEARNING AND SHARING LK | 30 | 70 |
| LK FOR FRM WITHIN COMMUNITIES | 45 | 1150 |
| FLOOD CHARACTER | 41 | 303 |
| LOCAL INSTITUTIONS | 33 | 98 |
| PHASES OF FLOODING | 43 | 749 |
| AFTER | 33 | 111 |
| BEFORE | 42 | 434 |
| DURING | 33 | 204 |
| NEW APPROACHES TO FRM | 37 | 182 |
| EXTERNAL FRM INTERVENTIONS | 36 | 133 |
| TRAINING BY NGOS | 27 | 49 |
| PERCEPTIONS OF LK | 42 | 612 |
| CHANGING NATURE OF LK | 38 | 211 |
| LK AND MODERN APPROACHES | 36 | 145 |
| LK AND OUTSIDERS | 23 | 57 |
| LK BENEFITS | 34 | 105 |
| LK LIMITATIONS | 29 | 94 |

Figure 3.9 Example of coding from NVivo

While the process so far was done manually, the next stage involved using computer software for qualitative data analysis, namely NVivo 11. The decision to use the software was made due to the large amount of data collected. NVivo was predominantly used as a software for data management since it allowed for easy grouping of data scattered across transcripts and ease of access during the analysis. NVivo was used to conduct focused coding. During the process of focused coding, a further refinement was done, with merging the existing codes, adding some new codes and completely removing others. During this process, final themes were created. Examples of themes, sub-themes, and codes generated while analysing the community-level data on LK for FRM are presented in Figure 3.9.

Since the data were collected from different stakeholder groups, the process of data analysis was undertaken separately for each of the groups. During analysis, data were

constantly described, compared across cases and stakeholder groups and related between different themes and categories, generally following the qualitative data analysis process recommended by Bazeley (2013). Throughout the process, several important analytical decisions were made that influenced how the analysis was presented throughout this thesis. First, it was decided to present the findings according to different stakeholder groups, by presenting the insiders (i.e. community) ‘side of the story’ and ‘externals’ (i.e. government, NGOs and FRM consultants) side of the story. This was deemed appropriate since it allowed for understanding the topics researched in this thesis through different perspectives of all the actors involved in the CBFRM process. Secondly, the decision was made to present the findings from different communities in an integrated and a cross-case-study manner, since the individual case study analysis showed there were no significant differences in the data collected between different case study communities.

3.7.2 Analysis of secondary data

Analysis of secondary data involved reading through the gathered documents (e.g. policies, reports produced by FRM consultants) and highlighting the pieces of interest. For instance, while reviewing the policies, a special emphasis was given to understanding whether communities and their roles are considered in respective policies. Similarly, while reviewing the policies, the researcher was looking at whether LK is mentioned and in what context. Although secondary data proved useful for understanding the context (e.g. contingency plans in Chikwawa and Nsanje), the analysis mainly involved analysing the primary data since these presented the core of empirical evidence generated by this thesis.

3.8 Validity and reliability precautions

Qualitative research is often criticised as being too subjective, difficult to replicate, problematic to generalise, and lacking transparency (Bryman 2012). While the issue of generalisation was addressed in Section 3.2, and transparency was ensured through providing a detailed account of data collection and analysis procedures (Sections 3.6 and 3.7), this section elaborates on the validity and reliability of presented research. Explaining the steps taken to ensure validity and reliability is important to establish the rigour of the study (Morse et al. 2002). In broad terms, reliability is concerned with replication and consistency (i.e. whether the same findings could be replicated by different researchers in a different project), while validity establishes whether the analysis and findings are accurate (Saunders, Lewis, and Thornhill 2016b). These concepts are commonly applied in quantitative research, and their use in qualitative approaches is

contested and heavily debated (Seale 1999, Noble and Smith 2015). Moreover, there are no straightforward guidelines on how these could be operationalised (Morse et al. 2002).

Despite this lack of consensus, writers of qualitative methodologies have developed advice on procedures needed to be followed in order to ensure the quality of qualitative research. In this study, the following precautions were taken in order to ensure the quality of research with regard to validity and reliability, based on recommendations from the literature (Morse et al. 2002, Bryman 2012, Creswell 2013, Creswell and Creswell 2018):

- *Triangulation*: research findings are based on analysing the data collected by using multiple and different research instruments, namely, interviews, FGDs, direct observations, and documentation.
- *Clarifying positionality*: potential influence of researchers' values, beliefs and background and how these might have influenced the findings were explicitly stated.
- *Peer reviewing*: during the course of PhD studies, two academic papers in international journals (Šakić Trogrlić et al. 2018, 2019), and one conference paper (Šakić Trogrlić et al. 2017) were published. During the process of publishing, through peer-review, there was an opportunity for an external check of the research process and applied methodological procedures.
- *Multiple cases for analysis*: the findings presented throughout the present research are based on multiple case studies, thus allowing for building a more representative understanding of researched phenomena. According to Blaikie (2009), using multiple cases at different sites is one of the strategies for improving the generalization of the findings.
- *Representing different realities*: the topics of inquiry were approached through the views of different stakeholders involved in the process of CBFRM in Malawi. This allowed for a holistic view on the topic, and also a fair representation of the accounts of different social actors.
- *Sampling approaches*: the sample of participants from different stakeholder groups was chosen based on pre-defined criteria, thus allowing understanding to be gained from the real 'experts' on the topic (i.e. people directly involved in phenomena studied).

- *Detailed and transparent methodological procedure*: the present chapter provided a thorough description of the methodological procedures employed in the research, thus allowing the replication of the process (i.e. transferability). However, as argued by Blaikie (2009), replication in qualitative research is hardly possible to achieve because of the fact that the researcher ‘injects’ parts of themselves into the analysis as well as the inability to replicate the same social setting due to its spatial and temporal dynamics.
- *Multiple opportunities for fieldwork utilised*: the findings were based on three distinct fieldwork periods. This provided an opportunity to revisit the findings and enrich them with additional data. For instance, during the main fieldwork, additional data on the challenges for CBFRM were collected-the focus on which was in the scoping fieldwork.
- *Detailed transcriptions and coding procedure*: all the data collected during the fieldwork were transcribed in detail and can be audited. Similarly, the coding procedure developed is available in NVivo.

3.9 Chapter summary

The chapter provided an elaborate description of the methodological procedure adopted. The study is based on an interpretivist research framework and adopts a qualitative approach, following the case study research design. The primary data were collected during three periods of fieldwork in the Lower Shire Valley in Malawi, through the use of FGDs, semi-structured key informant interviews and direct observations. Secondary data was collected from the available documentation. The chapter has provided a detailed account of fieldwork design and execution, followed by elaborating on how the data were analysed using a thematic analysis. In order to ensure research transparency, the researcher’s positionality and the ethical procedures followed were elaborated in detail. Finally, precautions taken to ensure research validity and reliability were presented. The following four chapters will present the empirical findings generated through the fieldwork and data analysis.

Chapter 4- Community-based flood risk management in Malawi: setup, stakeholder roles and challenges

The analysis presented in this chapter contributes to achieving the first objective of this research: to critically explore existing CBFRM in Malawi. It provides a useful contextual understanding of current CBFRM needed for the later discussion on the role LK plays within it. This chapter builds its analysis based on data collected both from secondary and primary sources during the scoping fieldwork in 2016 and the main fieldwork in 2017.

The primary data are presented as direct quotations. Data from communities are presented by providing an interviewee code (Community Key Informant Interview- CKII), or specifying where the FGD took place. For the participants coming from the government, a differentiation was made between the participants from the national level (National Level Government- NLG), and local level (Local Government-LG). Similarly, a differentiation was made between NGO interviewees from the districts (Local NGO-LNGO) and those interviewed at the national level (National Level NGO-NLNGO). Consultants tasked by the government to implement a specific project were coded as the National Level Consultant (NLC). The secondary data were used to explain the legal, policy and institutional framework for CBFRM.

The chapter starts with a description of the legislative and policy environment for DRR in Malawi, followed by the institutional setup through which CBFRM is delivered (Section 4.1 and Section 4.2, respectively). Section 4.3 then unpacks how different stakeholders engaged during the data collection interact with each other in the process of CBFRM; followed by a brief overview of CBFRM initiatives implemented (Section 4.4). In Section 4.5, the existing CBFRM system is critically analysed via the perspectives of different stakeholders, by focusing on the challenges they encounter.

4.1 Legal and policy framework

In Malawi, the legal and policy landscape of DRR is diverse and stems from various sectors in the country. As argued by Botha et al. (2018), the development of the legal and policy landscape in the country mirrors trends at international levels. This implies a changing focus from response and relief oriented documents to an increased focus on proactive approaches tailored towards resilience building of vulnerable communities (*ibid.*).

4.1.1 Legal framework

The prime legal document is the Disaster Preparedness and Relief Act (DPRA) of 1991 (Government of Malawi 1991). This document established a foundation for the current DRR institutional and financial arrangements in the country. However, since it is focused on response and reactive action (Kita 2017a, Botha et al. 2018), it is considered outdated (Atkins 2011). Hence, the Government of Malawi started a review process in 2014 (Chiusiwa 2015) resulting in the Disaster Risk Management Act (DRMA) (Government of Malawi 2015b).

Unlike DPRA, DRMA asks for careful delimitation of disaster-prone areas, the establishment of national and local level DRM and contingency plans, and outlines funding arrangements at national and local levels. However, as interviewees from the government explained, even five years after its drafting, DRMA has not yet been formally approved. Without this legislation finalised, it is not possible for the Department of Disaster Management Affairs (DoDMA), a prime governmental body for DRR in the country, to devolve its functions to local levels and receive a dedicated budget line. Hence, the existing legislative landscape for DRR in the country is not conducive to anticipatory and proactive approaches.

4.1.2 Policy framework

The development of policy landscape in Malawi indicates that DRR is present in decision-makers' agendas, cuts across different policies and is envisioned as a multi-stakeholder process requiring cross-sectoral collaboration and significant investments. In 2015, the National Disaster Risk Management Policy (NDRMP) was adopted as the main policy framework guiding implementation and coordination of DRR in the country (Government of Malawi 2015c) in line with the Hyogo Framework for Action. The vision of NDRMP is a nation resilient to disasters, and the long-term goal is to '*sustainably reduce disaster losses in lives and in the social, economic and environmental assets of individuals, communities and the nation.*' (Government of Malawi 2015c, p.4). The associated implementation of policy goals, outcomes and priorities will require multi-sectoral commitment, political will, institutional and legal frameworks and availability of resources (Government of Malawi 2015c).

In addition to NDRMP, a reference to DRR is explicitly made in a number of national policies, indicating governmental recognition of the importance of DRR and the

contribution it can make to the overall development of the nation. For instance, the National Water Policy (MoAIWD 2005) identified the importance of preparedness and contingency plans as a part of overall water resources management. Furthermore, Malawi's most recent national development blueprint, Malawi Growth and Development Strategy III (MGDS III) acknowledges the importance of DRR under the Disaster Risk Management and Social Support theme (Government of Malawi 2017). Similarly, DRR was identified as a separate theme in both MGDS I and MGDS II (Government of Malawi 2006a, 2011), in the National Adaptation Programme of Action (NAPA) (Government of Malawi 2006b) and the National Climate Change Management Policy (NCCMP) (Government of Malawi 2016a).

In 2017, through a World Bank-funded project, the National Guidelines for Community-Based Flood Risk Management (NGCBFRM) (MoAIWD 2017a) were developed, that aim to assist in the selection of flood measures in certain areas, as well as provide advice for the development of local-level FRM plans. The Guidelines are accompanied by the Toolbox of Measures, a document that specifies the design and construction considerations of possible FRM measures, and covers measures for flood prevention, protection from flooding, flood preparedness, EWS and emergency response, together with tools and tips for flood experts (e.g. how to calculate a design flood) (MoAIWD 2017b). Although guidelines present a significant contribution towards the enhancement of CBFRM in the country, they are still in the draft form and have not been finally approved by the national government. Interestingly, during the interviews, some of the national level governmental participants stated that they were not involved in the development of these guidelines, with the process led by an international consultant; thus, the ownership of these documents is compromised, as the interviewees from the government showed scepticism towards the guidelines.

Recently, Botha et al. (2018) provided an analysis of the policy framework for DRR in Malawi, and they suggested that there is a lack of integration between different policies, and that the policies are wide in scope and without an adequate funding source. This suggests that despite its comprehensiveness, there are challenges related to policy implementation, which was also confirmed by the participants coming from the government consulted in this research.

4.1.3 Communities and local knowledge in the current policy and legislation

The main policies recognise local communities as core players whose participation is an important ingredient for successful policy implementation. This indicates a conducive policy environment for community-based approaches. For instance, NDRMP emphasises a need for community-level DRM plans, effective communication of risk information to communities, and development of capacity building, training and learning programmes for communities (Government of Malawi 2015c). It also explicitly recognises the importance of CBDRR by aiming to ‘*ensure the promotion of sustainable and long-term community-based disaster risk reduction measures.*’ (*ibid.*, p.8). Similarly, The MGDSIII puts a strong focus on community-based approaches, as evident from the following excerpt:

‘Community participation and volunteerism will be promoted, supported and initiated, particularly where communities are known to be at risk. Disaster risk management systems shall be decentralised and community-based whereby communities shall play active roles in the planning, execution, monitoring and evaluation of disaster risk management projects and programmes’ (Government of Malawi, 2017; p.11)

Furthermore, as one of its guiding principles, the DRMA outlines community participation and calls for a community-based approach (Government of Malawi 2015b). This presents a substantial improvement from the DPRA (Government of Malawi 1991), where the role of communities was not acknowledged at all, indicating a shift in legislation towards the acknowledged importance of communities.

Considering that LK is a focus of this research, it was important to review relevant legislation and policies to establish whether there is an explicit reference to LK (Table 4.1). As is apparent, LK is recognised as valuable, especially as a complement to scientific warning information and as a contribution to local-level risk assessments. More research on the topic is called for, and there are calls for the validation of LK. The extent to which these policy aspirations are translated into practice will be discussed in Chapter 7.

Table 4.1 Reference to local knowledge in Malawi's legal and policy documents

| Policy/legal document | References to local/indigenous/traditional knowledge |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disaster Risk Management Act (Government of Malawi 2015b) | Under Guiding Principles ‘Disaster risk management policies and planning processes will recognise and take into account cultural diversity, gender issues, the special needs of vulnerable groups and the relevance of indigenous knowledge as a valuable resource.’ |
| National Disaster Risk Management Policy: Implementation, Monitoring and Evaluation Strategy (Government of Malawi 2015d) | Strategy 1 of the Policy Priority Area 3: ‘Acquire risk information by systematically collecting data from scientific and indigenous sources and disaster risk assessments’ Strategy 1 of the Policy Priority Area 4: ‘Develop and implement a national DRM communication strategy that engages the media, takes into account indigenous knowledge and reaches all stakeholders’ |
| National Disaster Risk Management Communication Strategy (Government of Malawi 2014) | As a part of the Key Focus Areas and Guiding Principles ‘Indigenous knowledge is plentiful and should be valued and used to supplement scientific knowledge and technologies. Local knowledge is increasingly being lost with new generations, thus efforts should be made to document and share this knowledge in order for it to continue being passed on and used by the youth. It is essential that local knowledge on areas such as early warning be validated and complemented with scientific knowledge and methods, especially in order to turn early warning into early action. Combining knowledge and technologies ties in to the need to involve communities and more effectively adapt to climate change.’ |
| Malawi Growth and Development Strategy III (Government of Malawi 2017) | Theme Climate Change Management Sub-theme Improved weather and climate monitoring for early warning, preparedness and timely response ‘Conduct research on indigenous rainfall indicators’ Theme Vulnerability, Disaster Management and Social Support Sub-theme Improved understanding of disaster risks ‘Ensure the use of traditional, indigenous and local knowledge and practices to complement scientific knowledge in disaster risk assessment and early warning’ |
| National Climate Change Management Policy: Implementation, Monitoring and Evaluation Strategy (Government of Malawi 2016b) | Under Policy Priority Area 4 (Research, Technology Development and Transfer, and Systematic Observation), Objective 4 (To promote research, research innovation and technological innovation for mitigation and adaptation) ‘Promote access to research grants for centres of excellence to undertake research in climate change adaptation and mitigation, including indigenous knowledge’ |
| National Guidelines for Community-Based Flood Risk Management (MoAIWD 2017a) | The guidelines also make a very explicit reference to LK and indicate its usefulness. For instance, LK of previous floods is seen as a basis for flood zoning, and for identifying flood extents, frequencies, magnitudes and safe places within villages. According to the guidelines, the value of LK is especially relevant in the absence of scientific data. |
| National Environmental Policy (Government of Malawi 2004) | ‘Promote use of appropriate indigenous knowledge and norms for sustainable forest resource use and management’ |

Although recognised in the policies, communities are marginally involved in their development, as identified by some of the interviewees from NGOs and government. Moreover, even local governments are marginally involved, since policies are created at national levels. This suggests that policy creation is largely a top-down exercise from which inputs from the local governments and communities are excluded.

4.2 Institutional framework

4.2.1 General administrative and governance setup

Malawi is divided into three administrative regions (Northern, Central and Southern) and 28 districts. Following the transition to multi-party democracy in 1994 (Gaynor 2010, Manda 2014), and in line with the Local Government Act (Government of Malawi 1998a) and Malawi National Decentralisation Policy (Government of Malawi 1998b), Malawi has a decentralised governance setup, where local governments at district levels are provided with administrative and political powers. This process aims to improve the delivery of public goods and to facilitate community participation in governance and development initiatives (Cammack 2011, Waylen and Martin-Ortega 2013). Under decentralisation, national level ministries are required to devolve their functions and resources to district levels (Kita 2017a). There are two parallel governance structures in Malawi: democratic and traditional, as presented in Figure 4.1.

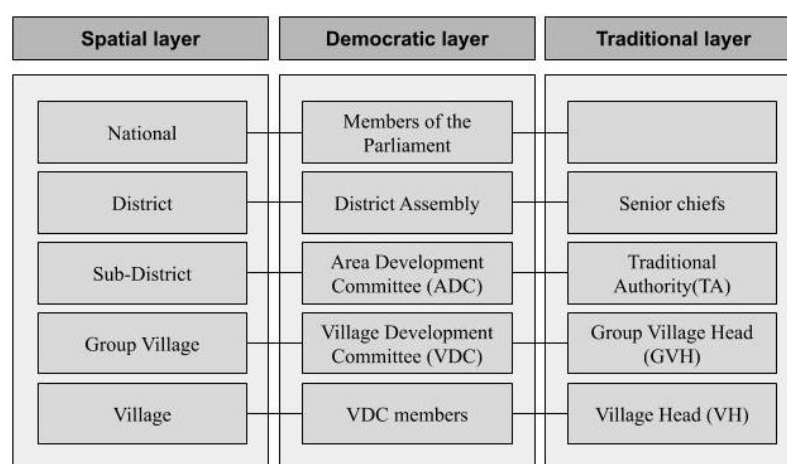


Figure 4.1 Administrative and traditional governance layers in Malawi (adapted after Chowns 2014)

The democratic system is composed of local government structures at District level, Area level and Group Village Head (GVH) level, with districts being the basic planning and implementation unit (Chiusiwa 2015). At the district level, the main governing and

political decision-making body is District Assembly²¹ (O’Neil and Cammack 2014). The executive arm of the local government is composed of the District Executive Council (DEC), chaired by the District Commissioner and with the representation of different sector heads (e.g. Health, Planning and Development, Public Works, Health, Education, Agriculture) and NGOs (*ibid.*). DEC has a responsibility of overseeing and coordinating development initiatives at district level. At the lower layers, DEC is supported by the work of development committees (the Area Development Committee- ADC at the TA level and the Village Development Committee- VDC at the GVH level).

The traditional governance structure is composed of traditional leaders (i.e. chiefs) at different levels. In Malawi, chiefs have had an important role in local level governance since pre-colonial times and were formally recognised after the introduction of multi-party democracy in the 1990s (Muriaas 2009). They hold considerable power in land allocation and serve as advisors to development committees at TA and GVH levels (Chowns 2014). Communities see chiefs as people of trust and rely on them in solving the local level problems (Kita 2019). Furthermore, chiefs are mandated to represent their respective communities in certain political bodies at district levels (Muriaas 2009).

4.2.2 Institutional setup for disaster risk reduction

Following the decentralisation structure described above, Malawi also has a decentralised DRR institutional system (Figure 4.2). The roles and responsibilities of different institutional stakeholders across administrative levels are presented and outlined in the NDRMP (Government of Malawi 2015c). Table 4.2 outlines the responsibilities of the national-level bodies involved in DRR efforts in the country.

At the lower administrative levels (i.e. districts, TAs and GVH), DRR is coordinated by Disaster Risk Management Committees (DRMCs)²². Since the present research focuses on local-level FRM, it is important to understand the roles of Civil Protection Committees (CPCs), defined in the Operational Guidelines for Disaster Risk Management (Government of Malawi 2009).

²¹ During data collection activities, participants were referring to District Assembly as a District Council

²² Prior to the National DRM Policy from 2015, these committees were found under the name of Civil Protection Committees (CPCs). During data collection, it was noted that virtually all the interviewees and FGD participants referred to CPCs, not DRMCs. Hence, this thesis refers to CPCs: District Civil Protection Committee (DCPC), Area Civil Protection Committee (ACPC), and Village Civil Protection Committee (VCPC).

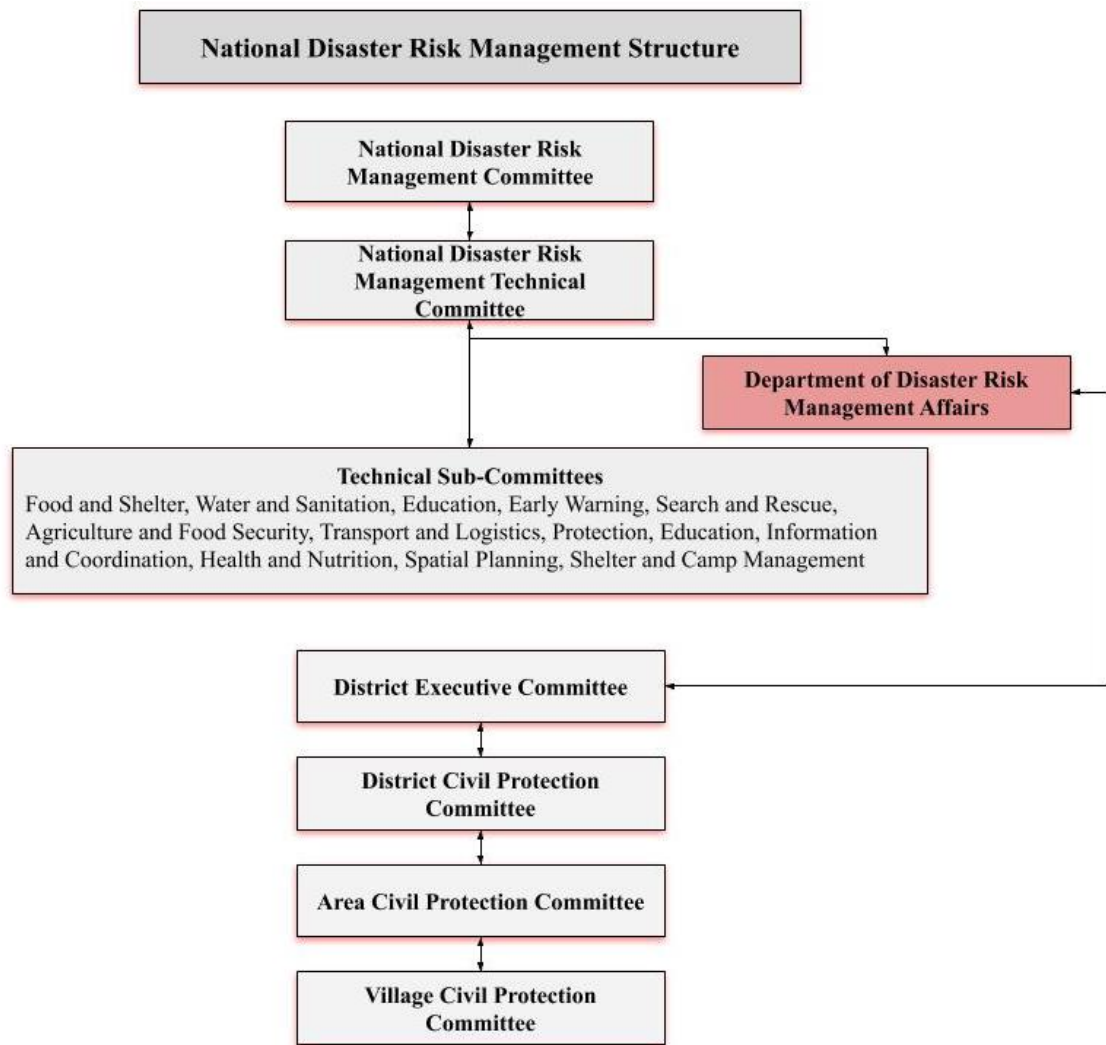


Figure 4.2 National disaster risk management structure (adapted from Government of Malawi 2015c)

Overall, CPCs are in charge of coordinating all matters related to DRR at their respective levels, including mitigation, preparedness, response and relief operations (UNECA 2015). At the district level, DCPC is a sub-committee of DEC, whereas ACPC and VCPC are sub-committees of ADC and VDC, respectively. One of the core activities of CPCs at all levels is the development of Contingency Plans and Disaster Risk Management Plans; the plans created at GVH level are supposed to feed into plans created at Area level, that are in turn supposed to feed into District level plans. The process of developing Contingency Plans, both at national and at district levels, is triggered by the release of the seasonal weather forecasts at the end of September (Botha et al. 2018).

Table 4.2 The role of national-level bodies involved in DRR efforts (collated based on the information from Government of Malawi 2015c)

| National level body | Responsibilities | Membership |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| National Disaster Risk Management Committee (NDRMC) | Provides policy directions | Principal secretaries of line ministries, police and military representatives, civil society |
| National Disaster Risk Management Technical Committee (NDRMTC) | Provides guidance and technical expertise, coordinates mainstreaming of DRR into policy and planning | Ministries, NGOs, donors, UN agencies, academia, civil society, private sector, media |
| National Disaster Risk Management Technical Sub-Committees (NDRMTSCs) | Provides coordination and advisory in the planning and implementation across the phases of the DRM cycle | Members from the NDRMTC |
| Department of Disaster Management Affairs (DoDMA) | The main governmental body for DRR, in charge of coordinating the implementation of the policy. At District levels, its mandates are coordinated by the Assistant Desk Officers. | - |

Although a decentralised institutional setup exists in Malawi, previous research found it to be inefficient, owing to funding and human resources shortages at lower administrative levels, poor coordination between administrative levels, and abuses of power by some of the local level politicians and councillors (Kayuni and Tambulasi 2011, O’Neil and Cammack 2014, Kita 2017a). Consequently, the government is not in a position to effectively deliver services to its people, including DRR.

Therefore, local and international NGOs complement governmental efforts. International aid politics generally favours channelling the aid to (I)NGOs rather than the governments of developing nations (Barber and Bowie 2008), and Malawi is no exception (UNECA 2015). In Malawi, NGOs do more than merely complementing the governmental efforts, and are at the forefront of implementing FRM in the country, primarily through community-based approaches delivered by approximately 80 different NGOs, both international and local (Shela et al. 2008, Lumumba Mijoni and Izadkhah 2009, Nillson et al. 2010, Kita 2017a). For example, data for the year 2013-2014 shows that 74% of climate-related aid was given to non-state actors (Kita 2017a citing OECD 2016).

4.3 Understanding the modes of working between different stakeholders

The national government creates legislation and sets policy direction. Through DoDMA, it oversees overall DRR in the country, including CBFRM, and coordinates the implementation of the NDRMP by both governmental and NGO stakeholders. Although the overall coordination lies with the national levels, the majority of the actual

implementation and interaction between stakeholders happens at district and community levels, as presented in Figure 4.3.

4.3.1 Interactions at district levels

At the district level, CBFRM is characterised by a nexus between local government and NGOs. Local government, through DCPC and DEC, has a mandate to coordinate all the FRM activities (e.g. mobilisation of resources, information sharing with decentralised structures), including all the activities implemented by NGOs.

Upon arriving at the district, and before starting a specific project, NGOs are obliged to present their planned activities to DEC, which provides NGOs with guidance, including in which areas they are supposed to implement their activities. Furthermore, drawing on civil servants specialities, local government supports NGOs with technical expertise (e.g. District Water Officer assisting NGOs with setting-up community-based early warning systems). Finally, district government officers are in charge of the monitoring and evaluation (M&E) of projects implemented by NGOs.

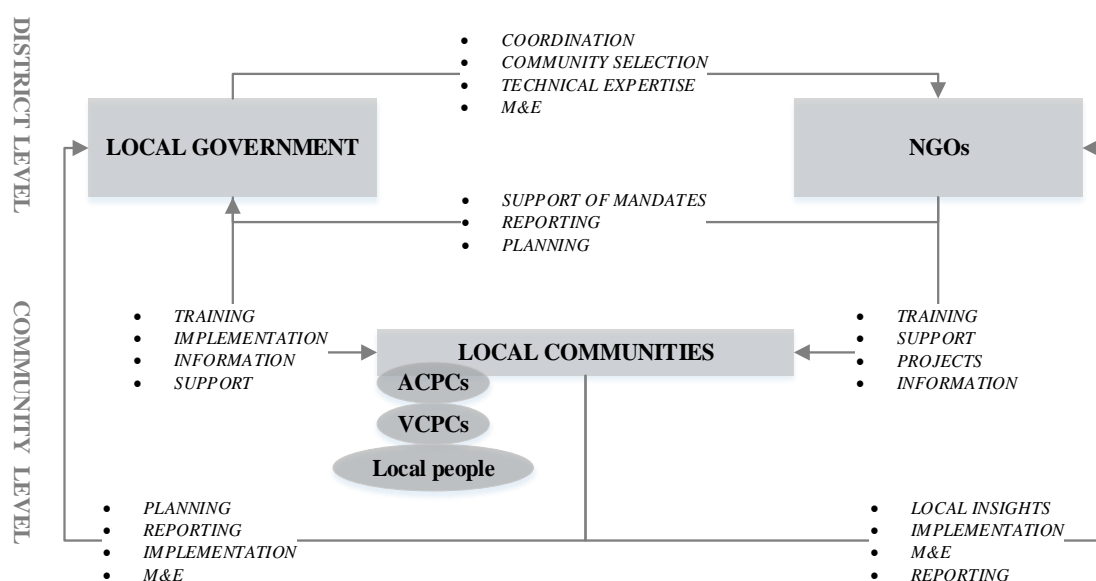


Figure 4.3 Interactions between core stakeholders

Different governmental departments are involved in CBFRM at district level through membership of DCPC. Since there is no separate budget line for DoDMA, different departments implement activities that fall under the realm of FRM in their work with communities (e.g. reforestation, river banks protection).

NGOs are supporting government mandates. This was heavily emphasised by research participants from both the NGOs and the government.

'The government is supposed to reach all the people with all the social services. But because the government cannot do, NGOs are there to compliment, but it is like vice-versa. It is like the chief duty bearer is the NGO, and the government is there to support.' (LNGO1)

The researcher also observed during the fieldwork the presence of NGOs in the communities to a much greater extent than the government; for instance, NGOs assist in the development of district-level contingency and development plans by providing finances and knowledge from the grassroots; they form and train CPCs; they deliver various development projects with a component of DRR/FRM. In order to assist with the overall coordination efforts, NGOs are asked to give regular updates on their activities and submit reports to the local government.

4.3.2 Interactions at community levels

Local government and NGOs (or more often, NGOs with the involvement of individuals from the local government) provide capacity building training to CPCs and share information with communities (e.g. early warning information, seasonal forecasts). They provide support: for example, material inputs in flood mitigation activities, community-level planning support in the design of village contingency and village action plans, provision of relief after the floods. A more detailed account of various activities implemented in communities will be given in Section 4.4.

In existing CBFRM, the community is represented through VCPCs and ACPCs. The spatial focus of this thesis was on the GVH level, and thus more insights on the work of VCPCs were gained. In the current setup, VCPCs are mediators between communities at large and external stakeholders. Therefore, they are uniquely positioned to share insights from the grassroots with project implementers, including LK. VCPC members highlighted their involvement in a wide range of practical activities, such as installing river training works, planting trees and grass, capacity building training, warning message dissemination, provision of advisories to people in flood-prone areas, and search and rescue. VCPC members are involved in participatory activities (i.e. Participatory Rural Appraisals), and they receive training²³ which they are supposed to cascade to other

²³ Standard training of the VCPCs, conducted by NGO with involvement from the government includes modules on conducting Hazards, Vulnerability and Capacity Assessments, developing contingency and DRM plans, early warning systems, disaster impact and needs assessment and reporting, disaster response and recovery.

community members. Moreover, VCPCs are in charge of facilitating planning at local levels, through the production of Contingency Plans and Action Plans, the outcome of participatory activities identifying local needs and proposed solutions. These documents are supposed to guide any development (including FRM) work at community levels, as well as inform the district level documents.

VCPCs are the first point of contact for any organisation that comes to work in the community. They assist in the selection of project beneficiaries (e.g. individuals that will receive an allowance for working on road reconstruction after the floods), actively support implementation of activities (e.g. in communities where there is community-based early warning system, there will be a designated VCPC member doing the readings), and provide material inputs (e.g. collect stones and sand for construction purposes). Finally, VCPCs have a mandate to monitor that the projects are being implemented according to community wishes.

4.4 Examples of projects implemented by the government and NGOs

4.4.1 Government projects

Government-led projects active during the time of data collection in 2017 are presented in Table 4.3. These are coordinated at the national level and implemented through a joint effort of different government agencies, with a leading role for DoDMA. As pointed out by some of the interviewees from the government, given the severity of the flooding problem in the Lower Shire Valley and the cost of investment, large-scale infrastructure (e.g. embankments) needed to mitigate flood risks is not justifiable. Therefore, the current emphasis is on non-structural approaches to FRM; most prominently, on improving the early warning system. The participants from the government saw a lot of value in community-based approaches focused on small-scale interventions as a way to deliver FRM in flood-prone areas, and generally emphasised that NGOs are greatly supporting them in this endeavour. Figure 4.4 provides photographic evidence of some of the projects visited during the main fieldwork in 2017.

Table 4.3 Overview of large scale FRM projects in Malawi

| Project | Funder | Project Description | Benefit to communities |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Malawi Flood Emergency Recovery Project (Government of Malawi 2016c) | World Bank | <p>Project initiated in a response to 2015 floods. Composed of three components:</p> <ul style="list-style-type: none"> • Livelihoods restoration and food security • Infrastructure rehabilitation and reconstruction (e.g. roads, dikes) • Institutional strengthening of the Department of Disaster Management Affairs | <p>Component 1: 'input for assets' programme, local people provide labour, in return receiving food or cash.</p> <p>Component 2: provision of infrastructure</p> <p>Component 3: Development of community mapping activities</p> |
| Shire River Basin Management Programme (MoAIWD 2015b) | World Bank | <p>The FRM component of the project includes:</p> <ul style="list-style-type: none"> • Developing national guidelines for community-based flood risk management • Facilitating the planning and implementation of flood mitigation and adaptation measures • Connecting flood forecasting from basin to community levels • Improving the warning response capacity at district, area and community levels <p>Establishment of the Operational Decision Support System (ODSS) for a modern forecasting system using weather, hydrological and flood modelling prediction tools. The project also installed automated river flow gauges in the Lower Shire Valley.</p> | <p>Infrastructure implementation in the villages, capacity building trainings to CPCs (e.g. general FRM training, EWS training), development of local flood action plans, provision of equipment (e.g. megaphones).</p> <p>Communities in the Lower Shire Valley to benefit from more accurate flood warning information</p> |
| Strengthening Climate Information and Early Warning Systems in Malawi to Support Climate Development and Adaptation to Climate Change (UNDP 2015) | Global Environmental Facility | <p>Project related to Climate Change Adaptation, aims to strengthen climate services in Malawi. Project provided new 21 meteorological stations, 100 new rainfall observation stations, 53 automatic weather stations, resulting in improved flood forecasting.</p> | <p>Communities in the Lower Shire Valley to benefit from more accurate flood warning information; and from a system that will use SMS messages to disseminate the warnings to members of VCPCs.</p> |



Figure 4.4 Some images from the sites of government-led projects (author's own, June and July 2017): a) villagers discussing dike design with consultants in GVH Nafafa, b) automated river gauge at Shire River, c) replanting of vertiba grass GVH Monica d) dike constructed as a part of the Malawi Flood Recovery Emergency Project, e) dike construction in GVH Tengani

4.4.2 NGO projects

Field visits, coupled with responses through the interviewees, indicated that NGOs present in the Lower Shire Valley are implementing a vast array of different projects (Figure 4.5), spanning across mitigation, preparedness, response and recovery aspects. Examples include:

- mitigation (e.g. river training works, reforestation, planting of grass, construction of dikes)
- preparedness (e.g. capacity building, community-based early warning systems, simulation drills, scenario planning, evacuation centres, sensitisation meetings)
- response (e.g. food distribution, sanitation and hygiene, shelter provision, provision of drinking water)
- recovery (e.g. livelihood support, cash transfers, rehabilitation of infrastructure)

As it can be noted, the majority of these projects are focused on the technical aspects of risk management, such as physical construction or training aimed at increasing peoples' preparedness. CBFRM projects in the Lower Shire Valley are rarely 'stand-alone' projects. In other words, they are part of the overall development projects implemented in the communities, with FRM (or more broadly, DRR), being a project component. For instance, Enhancing Community Resilience Programme (ECRP) in Nsanje based their approach not solely on implementing FRM related activities (e.g. early warning systems, establishment of VCPCs), but also on providing farmers with small-scale irrigation schemes, training them in conservation agriculture and catchment management, as well as mainstreaming the issues of gender (CARE International 2018). Interviewees have seen the importance of flood risk reduction as a way to ensure that development gains were not lost:

'Disaster section is coming to provide a foundation to make sure that gains that have been gained in other sectors are not lost by disasters. That is where our sector comes in. Us, we are coming in to protect what has already been gained by others.' (LNGO10)



Figure 4.5 Examples of projects implemented as a part of CB-FRM (author's own, April 2016): a) community-based dike, b) evacuation centre, c) rainfall gauge, d) water level gauge, e) reforestation

Furthermore, data from NGOS reveals that many projects had components that aim to increase peoples overall wellbeing and capacity to deal with shocks, in order to be able

to bounce back soon after the floods. For instance, in many villages, people were talking about the ‘goat pass on’ programmes²⁴ and Village Saving and Loans (VSL)²⁵, perceived as being very beneficial due to creating additional assets in communities. Based on their experiences, interviewees from NGOs pointed out two important components of successful community-based projects. First, they argued that projects that combine a variety of interventions (e.g. dike construction, pass on programmes, VSLs, agroforestry, training in farming) yield better results in comparison to programmes that are focused on a single intervention. Secondly, programmes that have funding for longer timeframes (e.g. beyond three years) were seen as impactful, since they allow ample time to initiate transformation within a community.

Participants from both NGOs and government emphasised that CBFRM has brought a change in the approach to managing floods, mirroring the change in policy presented in Section 4.1.2. While previously FRM was seen as a matter of providing relief items to affected communities, nowadays it is more proactive and focused on resilience building as a part of the overall community development. The example provided through the following quotation emphasises this point.

‘After disasters we have been offering disaster response, but later on we changed our strategic thinking, and a way of thinking, say disasters come because of certain preconditions, and how do we reverse disasters by putting in place the right programmes and activities? Because of that, currently we don’t only work on disaster response, we also work on the issues of development here.’ (NLNGO3)

4.5 Challenges for community-based flood risk management in Malawi

The sections presented so far have provided a detailed description of CBFRM in Malawi. However, in order to develop a comprehensive understanding of how it unfolds in practice, it was necessary to engage with the experiences of those involved in CBFRM planning and implementation. This was done through identifying the challenges as seen through a lens of a specific stakeholder group (i.e. government, NGOs, communities). Analysis of the collected data highlighted that although individual stakeholder groups identified a range of different challenges, they all identified both internal (endogenous)

²⁴ As a part of this programme, communities are given goats (both male and female), and once when there is an offspring, people are supposed to forward it to a next person. The underlying idea is that the household will be better off in the case flood happens, because they will have an asset (i.e. a goat) that they can sell.

²⁵ Village Savings and Loans (VSL) aim to increase peoples’ asset base. Groups are formed within a community, and these groups receive a training on how to manage group savings. Each member of the group contributes an amount of money, according to financial capacity. Other members can take loans from the group. This can help group members to purchase items that might help them prepare for or recover from floods.

challenges connected to their own group and external (exogenous) challenges arising through interaction with other stakeholder groups. This insight highlights an interesting theoretical distinction between the internal and external factors that influence stakeholder behaviour and practice. Brooks (2003) cautions against viewing systems (e.g. households, communities, nations) as closed, and highlights the need to account for exogenous as well as endogenous factors. Within this context, the identified challenges detailed below are classified either as internal or external.

Generally, there were no differences between the stakeholders groups in the extent to which they were critical towards the other group; however, it was noticed that participants from a specific group were keener to criticise other groups than their own. Thus, constructing the understanding of CBFRM through engaging with different views proved to be a useful strategy.

4.5.1 Challenges for local communities

4.5.1.1 Internal challenges for communities

VCPC members identified the lack of resources as a major struggle, which also includes equipment needed for them to deliver their function (e.g. safety, transportation, communication equipment). As a female villager from GVH Bitrinyu bluntly stated: ‘*We have human capital, but need support with other resources.*’ For instance, even though VCPCs identify a need for a certain intervention to manage floods in their community (e.g. dike) and can provide labour, there is a need for external inputs (e.g. materials, excavators).

Participants also pointed out the lack of DRR capacity within a VCPC, as well as the knowledge on how to engage in the long-term maintenance of implemented projects. They explained that the training is often tailored towards a few individuals, thus leaving the rest of VCPC without proper skills. Furthermore, the tenure of the VCPC is three years, and once when their mandate finishes, new members of the committee receive no training. For instance, VCPC in GVH Mbenje explained that although the membership of the VCPC changed they have not received any training. Hence, they were unclear regarding their responsibilities and were not equipped with enough knowledge and resources to assist during the 2015 floods. These examples indicate that although VCPCs are established in the villages, they are often limited in the extent to which they can fulfil

their responsibilities due to inadequate resourcing and training; therefore, they should be increasingly supported.

Furthermore, the VCPC members raised concerns about levels of participation by some community members. An interviewee from GVH Mmodzi (CKII10) shared that people generally expect material inputs or financial compensation (often referred to as a 'handouts' culture by participants) in return for their participation, indicating a dependent behaviour. People lose interest in participating if they are invited to take part in an activity oriented towards long-term resilience building, as opposed to short-term relief. As mentioned by some community members, long-term involvement from communities is problematic, since participation generally ceases after the projects initiated by NGOs or government are phased out.

In relation to the selection of project beneficiaries within communities, VCPC members experience challenges because some community members, in the aftermath of floods, want to receive relief items even though they were not affected, indicating an aid-dependent behaviour. Some participants from the VCPC reported that even though the selection of project beneficiaries (e.g. identification of individuals working on dike construction) is their responsibility, their role is often overlooked, due to associated power relations within a community.

'They tell us that VCPC you are needed but when the time comes to register people they tell us the chiefs are the ones who will do the work. So most times we are not involved.' (FGD Mbenje)

This indicates the power held by local chiefs, especially when it comes to relief items distribution. The power component was also evident in the examples where participants shared that chiefs try to manipulate the processes related to community-based approaches by selecting relatives or individuals from their households to be involved in CBFRM projects.

4.5.1.2 External challenges for communities

According to community members, their participation in the existing system is limited. NGOs and governments working in the communities might ask for community views and priorities; however, often the projects implemented are not according to local expectations. As explained by an FGD participant in GVH Tizola: *'they meet us but have already decided on what they will do.'*, indicating a lack of community involvement in

project design. Some participants were concerned that, what they perceive to be their rich LK²⁶, is often disregarded by project implementers.

'Lack of our involvement means lack of our indigenous knowledge²⁷. So, there will be many deficiencies as far the project life is concerned.'
(FGD Mbenje)

There was a further concern regarding a situation where NGOs involve only local elites (i.e. chiefs) or members of VCPCs in project design. It was felt that this does not necessarily represent the needs of the community at large. As this example depicts, the concept of 'community' is difficult to operationalise in practice, as only limited views are taken on board.

In addition to the lack of participation in project design, data analysis revealed that participation is limited during project implementation. As mentioned during FGD in GVH Nyang'a, upon initially consulting the communities, once the implementation had started, communities were *'not able to have a say'*. Participants raised the issue of government assigning external contractors to implement the projects, because these contractors as seen by communities are not sufficiently motivated to deliver high-quality work, as they are not community members and as such, will not benefit from the project. However, as explained in GVH Nyang'a, if community members insist implementing the projects themselves, the government will demotivate them by lowering the price of the labour.

According to communities, NGOs lack accountability and transparency, both in terms of their budgets for CBFRM as well as in how they make their decisions. Similarly, some participants emphasised that they are supposed to be accountable to the government, whereas they lack feedback and clarity of how (and if) their inputs (e.g. provided through Village Contingency and Action plans) are considered at the higher decision-making and planning levels. Furthermore, communities identified poor communication between external stakeholders, resulting in duplication of efforts at the local scale, especially in terms of relief items distribution.

'It may happen that we are lacking food here but you find they are bringing blankets [...]. Some will come not knowing their friends have already given us blankets and they bring more blankets. The main problem is not addressed because of lack of communication.' (FGD GVH Medram)

²⁶ A more detailed account of the relationship between LK and external stakeholders, as seen through a community lens, will be given in Chapter 6.

²⁷ During the translation of the FGD, the researcher assistant used the term 'indigenous knowledge' in this specific instance.

This example points to deficiencies in the coordination of CBFRM at local levels. Finally, participants pointed out that NGOs and government may leave them with ‘lost promises’ of delivering projects that never happen. Similarly, it happens that NGOs leave communities prior to project completion. As a result, communities’ confidence in these external stakeholders is undermined.

4.5.2 Challenges for non-governmental organisations

4.5.2.1 Internal challenges for NGOs

Some of the internal challenges identified by participants from NGOs concerned the existing expertise, organisation of work and project planning within their respective organisations. For instance, whilst acknowledging that CBFRM projects require extensive and well-planned participatory activities, some participants questioned whether this type of capacity is available within their staff, revealing a concerning fact: organisations in charge of facilitating community participation might lack expertise in doing so. Furthermore, it was pointed out that NGOs have inadequate procedures for the management of documentation. For instance, the participant NLNGO6 shared that their organisation created hazard maps for several districts, but due to high staff turnover and a lack of proper documentation, these documents cannot be located. This indicates a loss of valuable information, especially for a country that is data-scarce such as Malawi.

The lack of sustainability of CBFRM projects was repeatedly emphasised. As a part of the reason, NGO members attributed the lack of exit strategies whereby ownership of the implemented projects would be transferred to communities.

‘I think that normally NGOs come in with the exit strategies too late. We know we are leaving the communities we are assisting. So we need to put in measures so that the actions we have been doing continue. But those measures come too late [...]. This cannot be done in three, four months, it cannot. It takes time.’ (FGD participant NGOs Nsanje)

Participants criticised the existing projects and suggested their impacts are limited, due to several reasons. For instance, an NGO employee from Chikwawa (LNGO10) pointed out that a lot of focus is on capacity building activities, rather than increased support towards physical infrastructure for FRM (e.g. dikes and dams). Furthermore, it was mentioned that current projects fail to address the prime causes of flooding problems in the communities (e.g. deforestation in the upper catchments), indicating that CBFRM in Malawi does not take a catchment-based approach, but is rather implemented in a disperse manner.

'A lot of NGOs are going to the Lower Shire. Why? Because their level of vulnerability is high. So they invest in adaptation like having irrigation systems and alike. When it rains, they all collapse with floods. So we are having a lot of development gains, and we feel like we are addressing the symptoms, not the root causes. Everybody goes where there is a problem. We are trying to see where we are going wrong. The thing now is that we should not target where there are symptoms, but what is the root cause?' (NLNGO13)

Furthermore, some participants felt that the limited impacts of CBFMR on the ground are due to the short duration of community-based projects, which does not create an opportunity for a transformative change.

'You know, as NGOs, we are advocating for development, and development cannot be done within one, two, three years. It needs to be a minimum of five years to see meaningful impacts. So, for projects that have got a longer lifespan, those are better because you can see a change. But projects like one year, six months, two years, they have their own challenges. For the NGOs, it is good for your staff, because you have something to do, but what about intention on the ground?' (NLNGO6)

An interesting finding is that internal challenges also stem from NGOs working relationship with their donors since this relationship directly determines the projects implemented on the ground. Some participants raised a concern that implemented projects often reflect donor agendas as opposed to the actual needs on the ground. For instance, an employee from a central NGO office in Lilongwe (NLNGO2) argued that *'most of the programming is rather prescriptive and not coming from the communities'*, indicating similarity with issues identified by communities in Section 4.5.1.2. Furthermore, LNGO1 provided an example of a project prescribed by donors and based on a different geographical context, which resulted in a very complex implementation, since the project was detached from the local context. The following quotation from an FGD in Nsanje exemplifies the challenge of donor funding and indicates that projects are not always representing a real need of a community, thus directly influencing sustainability:

'If communities are empowered and they say let's plant trees along the riverbanks, this can be done. But possibly our focus is on something else. [...] Normally, community-based activities do not need much. But maybe our budget lines are on other things. But this is embedded in each and every project that we are doing. Because, without this, the sustainability is not there. [...] We act and dance to the tune of donors. The donor say my money should be here, and if disaster mitigation is not there, what do you do? Nothing. Sometimes it is the demand of donors, they will deny you funding for disaster mitigation.' (FGD participant NGO Nsanje)

Several participants from NGOs reported the lack of flexibility of donors once the funding has been approved and the project is being implemented. In their view, it is challenging/virtually impossible to incorporate local perspectives or emerging issues, including LK, thus ensuring sustainability.

In addition to the challenges experienced within their organisations and with donors, some participants raised issues of approaches taken by other NGOs. The unconventional behaviour of some NGOs, who start activities without consulting local government for selecting areas for project implementation, leads to duplication of efforts in certain areas and paucity of activities in others. There is a lack of coordination, information sharing and transparency between different NGOs. As explained by LNGO19, this comes at the expense of different NGOs being able to complement one another in their efforts, suggesting a lack of a well-designed and planned CBFRM framework in the districts. Finally, participants pointed out that NGOs differ in their approach to mobilising communities to participate. These differing approaches result in aid-dependency syndrome and ‘handout’ culture since some NGOs will provide financial incentives for people to participate while others will not, which brings confusion to communities.

4.5.2.2 External challenges: NGOs and government

The participants from NGOs were highly critical of local governments. According to some, there is a lack of continued involvement of governmental departments, and this presents a major challenge, especially with respect to long-term maintenance of implemented projects. Although NGOs facilitate project delivery, participants emphasised that government has the responsibility for monitoring the projects beyond the project lifespan: *‘We expect that everything we are doing will be in the hands of government to continue.’* (LNGO13). Yet, many participants pointed out that this is not the case, thus representing a major contributing factor to the lack of project sustainability.

‘As NGOs we are time specific. Projects have a specific duration and then we are out. So, to make sure that activities or interventions [...] are sustainable, we need government personnel because they are there forever [...] Go there [to project sites] three, four years later and you will find that whatever was there is gone.’ (FGD NGOs Nsanje)

According to some NGO participants, this can be partly explained by the government being understaffed and having a lack of resources. For instance, extension workers from different governmental departments that support CBFRM are few, but are expected to cover large geographical areas and deliver services to a large number of people. The very

department in charge of coordinating FRM in the country, DoDMA, did not devolve its functions to local levels; as a result, it has no extension workers. It was also mentioned that the lack of involvement is due to attitude, which manifests in government workers expecting to receive allowances for their contributions.

‘One big challenge is government staff are very expectant. They are good in supporting projects if there is little something for them. Without incentives, they shy away from helping the NGOs.’ (LNGO17)

As LNGO1 explained, the expectant behaviour of civil servants leads to a paradox, because it seems as if they (the government officials) forget that NGOs are there just to complement the government and not vice versa. Many NGO participants stated that in the case allowances are not given, government workers simply opt for not being involved in delivery and monitoring of projects. This presents an interesting insight as it suggests that government workers’ attitudes directly influence the sustainability of implemented projects and that they see CBFRM also as a venue for gaining personal benefits.

Overwhelmingly, NGO participants pointed out that the government is doing poorly in delivering their mandates and is relying too much on NGOs, indicating a weak local government. For instance, although the annual update of District Contingency Plans is the responsibility of the local government, they will expect NGOs to fund this exercise. As explained by LNGO1, NGOs in Chikwawa decided to stop this support, and instead focus their efforts on advocacy of the importance of these plans. As a result, the contingency plan in Chikwawa was not updated. In both districts, District Disaster Management Plans were not available, and it was explained that these are not developed simply due to lack of funding. Similarly, the implementation of contingency plans relies solely on donors, with local government failing to contribute resources towards their implementation.

The government also fails to establish VCPCs without the assistance of NGOs, which are *‘active only where there is a project’* (LNGO3). This serves as another example of the government’s failure to deliver its mandates. The governments’ heavy reliance on funding from NGOs and donors, in combination with being passive in finding funding internally, was seen as a significant challenge.

According to participants, the allocation of projects, a process facilitated by local governments, needs to be revisited. Currently, there are areas in the districts in need of

projects, and yet, they are disregarded while efforts are duplicated in some other areas. As an additional reason for duplication, participants identified poor information sharing with NGOs, especially with respect to an overview of previous initiatives in respective areas. These examples suggest poor coordination of CBFRM from the side of local government.

Furthermore, the government was criticised for failing to engage with local communities. As put by NLNGO4: *‘most of the issues that are coming from communities are being communicated by civil society, not the government’*. Another participant (NLNGO15) pointed out that the government lacks resources to facilitate the participation of local communities. Furthermore, the planning documents in the districts are often copy-pasted from year to year, thus not representing the local dynamic and changing contexts. The government was further criticised for confusing community participation with a simple consultation with local leaders, which might not necessarily represent wider issues and disregards the existing power relations in communities.

‘You find a social profile of the district, and sometimes if you go and search, but if it is a true reflection of what was on the ground, usually it is not really the case. While you dig why that happened, they [the government] will say there were no resources for us to go deep down into the communities [...] we just had to come up with something, maybe use one or two people from the communities who would represent the masses, but not really represent the situation on the ground. [...] I think the communities have no voice.’ (NLNGO1)

4.5.3 Challenges for government

4.5.3.1 Internal challenges for government

Participants from the government identified lack of funding as a major internal challenge. There are no dedicated budget lines for DRR, with scarce governmental resources centralised at the national level, and predominantly tailored towards response and relief. This indicates that the current financial climate in the government is not conducive to the anticipatory approach. Lack of funding influences all spheres of governmental work. For instance, the DCPC, as the main local government coordinating body for DRR experiences challenges in the following aspects:

- developing and implementing contingency and disaster risk management plans
- providing services to communities in the areas where NGOs are not active
- monitoring implemented projects

- interacting with VCPCs, which, by inference, means a lack of community participation and input into district level planning documents
- providing training to and revamping VCPCs
- delivering relief items in the case of a flood

The collected data further suggest a lack of coordination between different governmental departments, both at local and at the national level, with a prime example at the national level being unclear responsibilities for the issue of flood warning. At local levels, the lack of coordination was evident in an inability to facilitate information exchange between CPCs at different levels. Furthermore, proper coordination is more challenging because there is no comprehensive monitoring system that would allow the government to know where, what type and by whom CBFMR projects are being implemented. Finally, several interviewees identified a lack of technical knowledge on the topic of FRM at the levels of national and local government, indicating a lack of capacity within the government.

4.5.3.2 External challenges: government and NGOs

As a major challenge in their work with NGOs, government representatives identified a lack of information sharing, evident in many aspects. Some NGOs make the local government aware of their projects at the very beginning of implementation, but fail to include the government later on in the process. This issue becomes further exacerbated by the lack of sharing of project reports with the local government, especially for projects of shorter duration.

‘The big challenge is the information sharing. We have got a problem there. Of course, we have got like NGOs, they are part of the DEC [District Executive Committee]. They come, they present whatever interventions they would wish to implement [...] Once when the implementation starts, the sharing of information now becomes a challenge. The NGOs, most of the NGOs, they will report to the donor who provided the funding [...]. But sharing the same information with the district, it becomes a challenge.’ (LG11)

The lack of information leads to a scenario where the government is not even aware of what is happening at local levels, thus making it challenging to fulfil their tasks in coordinating CBFMR. Participants felt that this significantly contributed to a lack of project sustainability, coupled with a perceived failure by NGOs to involve government staff during the implementation of projects. For instance, NLG7 shared an example where a certain NGO did not involve the government when installing rain gauges as a part of community-based early warning system, thus making this valuable source of data not

utilised by the agencies in charge of hydro-meteorological data collection. In a data-scarce country such as Malawi, this represents a missed opportunity. Interestingly, the participants from the government did not mention the issues brought up by the participants from NGOs (i.e. government employees' expectation of incentives for involvement in NGO projects).

Another identified challenge is a lack of budget transparency in NGOs, creating difficulty for local government in effectively coordinating CBFRM activities in districts and knowing the extent of investment. As one of the participants described:

'a lot of resources go down the drain because money is given to partners [NGOs] and they never come to disclose to government how much they have gotten.' (LG14)

Furthermore, coordination at district levels is influenced by those NGOs that decide to go directly to communities without informing or consulting with a government, often going to the areas that donors prefer. As explained by NLG7, donor concentration is an issue: *'Donors prefer work where they are just interested, not necessarily where there is a problem'*, indicating a challenge of a donor-driven agenda, already identified both by communities and NGOs.

Finally, some felt that it is challenging for the government to access funds from donors for mitigation and preparedness because donors are keener to release funds for response and relief.

'The donors, they wait until something happens, because they are not sure whether the disaster will occur or not.' (LG8)

This confirms a larger trend in disaster risk financing through international aid, where only a fraction of funding goes to risk reduction and preparedness, whereas the large majority is for when disasters have already struck. For instance, Kellet and Caravani (2013) have estimated only that 12.6% of \$106.7 billion allocated globally to disasters in a period from 1993-2013 was for preparedness.

Finally, some participants from the government expressed that although NGOs are facilitating community participation to a greater extent than the government, the current approach is not without challenges, and there is a lot of scope for improvement.

'The bottom-up approach is a way to go for NGOs, but some, due to limited time, probably they have secured funds, they are developing a

project proposal, they have a deadline and they have to go to communities, consult them. But looking at the timeframe they have, they cannot do all of that. So sometimes they just use shortcuts. [...]. Because when you ask them, they would say we did not have enough time. We consulted them, but after designing the project, before submitting to the donor, we are supposed to go back to them, to verify with them, but we did not do that, because we had limited time and all that. So the consultation is not adequate.’ (NLG6)

4.5.4 NGOs and government challenges with local communities

Since the same challenges of working with communities were identified both by the participants from NGOs and government, these are analysed together in the following sub-sections.

4.5.4.1 Dependency syndrome, lack of sustainability and ownership

Participants from NGOs and the government identified community dependency as the biggest obstacle to delivering and sustaining CBFRM. Communities in the Lower Shire Valley are used to the provision of aid, incentives for their participation, and relief. As noted by an NGO member during FGD discussion in Nsanje, community members perceive CBFRM as a matter of relief distribution, with actual risk reduction being ‘*a word of mouth*’. Some even argued that people in flood-prone areas consciously decide to ignore the warnings or relocate because aid-dependency and handout culture became a form of livelihood.

‘When disaster comes, NGOs, donors, they will give food. For us disaster is a life-threatening thing, but for them, they are looking forward to it.’ (NLNGO5)

According to participants, dependency is a big influencing factor in the lack of project sustainability and a general lack of ownership. Community members participate as long as the NGOs are implementing projects and they are provided with inputs. VCPCs were criticised for expecting constant allowances and failing to participate when they have no personal benefit, as well as for not being active beyond the project cycle. The participation ends once the project ends.

‘What we have learned is like the community becomes active when an NGO is active. When that project goes, the community also gets relaxed [...] The sustainability is not there.’ (LNGO6)

Interestingly, most participants acknowledged their role in creating this problem (especially NGOs), and stated that they hugely contributed to this culture, since they have

been both paying for the participation of communities (e.g. providing allowances to attend training) and providing relief items.

'Unless the culture has been broken, especially from NGOs, of buying communities to contribute with their results, it will be really difficult for this country to change.' (NLNGO13)

As a result, it is difficult for communities now to understand that projects oriented towards mitigation and preparedness aim to contribute to overall community development, as evident from the following quotation:

'You have members of the community, you are teaching them [...] they should focus on their strengths, you are not introducing anything to them. These are the people that have been accustomed to external responses where you give them cash, maize. And now, here you are telling them, ok, this is a resilience building programme, we are trying to assist you so that you are resilient and able to withstand the effects of climatic shocks. So it sort of contradicts. [...] I was first working on a humanitarian programme, and then it came this resilience programme. [...] The humanitarian programme was saying we are assisting you because you are vulnerable [...]. But the message that was taken home is ok, because we are hungry, that is why they are feeding us. But now we are saying, ok, we do not want to give you fish, but we want to give you the net for fishing. But they want fish again.' (NLNGO2)

4.5.4.2 Power relations at community level

The empirical data suggests that the hierarchy in the villages has direct implications for community-based interventions. Participants emphasised the importance of power relations within communities and the negative influences this has on CBFRM, especially in relation to local chiefs.

'We tend to underestimate the power of chiefs. The chiefs are more powerful in the communities, as much as we don't like to admit it, but they are powerful and they influence a lot of decision. If their influence is negative, most of the times it jeopardises our work.' (NLNGO2)

Chiefs often try to 'penetrate the system' (LNGO1) by imposing people from their own households and relatives as participants in activities, including the selection of members of different committees established in the communities (e.g. VCPC, VDC, Village Natural Resources Committees). This was seen as problematic since it might bring conflicts and impact the effectiveness of these committees, as it might implicate that the few individuals that received training and have responsibilities are not available.

'When you are trying to formulate community-based structures, you find that people who are found in these structures are the same people

as in other structures, and they have the link to community leaders. So in that case, I say that participation is not equal and not fairly spread within the community.’ (FGD DCPC Chikwawa)

An interesting example was shared when a chief tried to gain personal benefit as opposed to advocating for what is in the communities’ best interest:

‘We got all the people together [...] and they prioritised from their highest problem to their lowest problem. That part was more by the seniority of chiefs than what people wanted [...] There is a Paramount Chief, and he is quite a powerful chief. And there is a road that goes past his place, and the road is under water several times each year. And that came out as their highest priority. But actually, no houses are flooded from that.’ (NLC4)

The same participant explained that chiefs might influence other community members to exaggerate the scale of problems in their villages because they feel that will bring more development investment into their villages.

In addition to the chiefs, participants identified members of the VCPCs as holding power. The fact that VCPCs are the intermediary between communities and external parties gives them power since *‘they influence decisions at local levels’* (LNGO20). Similar to community accounts, some participants from NGOs and government pointed out the disconnect between a VCPC and the larger community and questioned the extent to which these community members cascade the training and skills they gained to the others. When implementing projects, VCPCs report to the NGOs and government, without involving the communities. As put by NLNGO15, *‘that means that development is over, the community has no say’*. It also suggests a lack of accountability of VCPCs towards community members they are representing.

As a result of power relations in communities, participants felt that the benefits of CBFMR are often not reaching those most vulnerable and marginalised.

‘Those people who are supposed to be assisted and benefit from the projects should be there, but sometimes people put on their relatives, especially if there are materials or things to be shared.’ (NLNGO16)

The examples presented throughout this section illustrate the complexity of engaging with communities in community-based work and point out the need to critically assess whose voices are actually presented. As will be discussed throughout this thesis, especially in Chapter 8, this has a direct implication on whose LK is included.

4.5.4.3 Additional challenges

In addition to the challenges presented above, participants from the NGOs and government identified several other challenges. First, as a result of high illiteracy levels, it is challenging to engage community members in some activities. For instance, it is challenging for communities to understand the content of the training they are given, which might result in the low uptake of external information.

‘Most of the issues to do with FRM, they are scientific issues. So because they are scientific issues, with the community levels of knowledge... Most of Malawians living in rural areas or living in community, they are illiterate.’ (LNGO10)

Secondly, some participants emphasised that floods are not the most pressing issues for these communities, but rather food insecurity, which can influence the participation:

‘When there is food insecurity, people go to look for food, they will not be in the village. So their priorities change. They will not be focusing on lesser challenges. They are not going to plant trees when there is no food in the house.’ (NLNGO15)

What this suggests is that when people live in a condition whereby their poverty is high and they lack access to basic needs, they are more concerned with their everyday risk (Ruszczuk 2017).

Finally, participants noted that communal projects tend to experience more challenges related to a lack of ownership when compared to individually focussed projects. An example of community-led planting alongside river banks was given, which NGOs perceive to struggle because *‘nobody owns the river’* (FGD NGOs Nsanje) and it is hence difficult for villagers to understand how such measures benefit them individually.

4.6 Chapter summary

Through an analysis of secondary data and detailed accounts of stakeholders’ experiences (i.e. primary data), this chapter explored existing CBFRM in Malawi. Overall, the results indicate that CBFRM is a dominant approach for dealing with floods in the Lower Shire Valley, due to the high concentration of NGOs and the limited capacity of the government to deliver their mandates.

Section 4.1 first explained the legal and policy background of CBFRM in Malawi, with results indicating a comprehensive policy environment for DRR. The existing policies recognise the importance of communities and advocate for community-based approaches.

However, the legislative environment is not equally facilitating. The current legislation is outdated, with a new act, supposed to devolve the governmental functions to local levels and create a budget line for DRR being in a draft form for five years. Overall, the involvement of communities and local governments in policy development is limited.

Section 4.2 then provided a detailed description of the existing institutional framework for DRR reduction in the country, both democratic and traditional. Policy implementation is a responsibility of local governments at district levels, through a decentralised institutional structure. In terms of FRM, the main players are civil protection committees. CBFRM is implemented through a multi-stakeholder effort, with involvement from the local government, affected communities and NGOs. The ways through which these stakeholders collaborate is presented in Section 4.3, describing a complex interplay between different stakeholders needed to deliver projects at the community scale.

Section 4.4 presented some of the projects, both government and NGO led, implemented in the Lower Shire Valley. It was found that the approach to FRM in the Lower Shire Valley manifests a shift from response and relief to more resilience-building activities at the local levels. Moreover, CBFRM projects are often designed and implemented with the idea of increasing people's overall wellbeing and capacity to deal with shocks. However, the majority of projects are focused on technical aspects of risk management (e.g. early warning systems, preparedness activities), which do not necessarily help with the underlying causes of peoples' vulnerability to flooding.

Section 4.5 then provided an in-depth understanding of the challenges experienced by different stakeholders, and these are summarised in Table 4.4. The explicit connection between the challenges and the role of LK will be made in Chapter 8. The findings indicate that the existing system has a lot of deficiencies and points to an interesting perspective: a generally favourable policy and institutional environment for CBFRM does not result in 'smooth' planning and delivery of FRM to local levels. Rather, it is a very complex process, with common and numerous challenges experienced across different stakeholder groups. The challenges emerge both internally (i.e. within a specific stakeholder group) and externally (i.e. through the interaction of one stakeholder group with the other), and relate to challenges in governance (e.g. accountability, transparency, coordination), financing, community participation and collaboration between different stakeholders.

Table 4.4 Summary of challenges for CBFRM identified by each stakeholder group against another group

| | Communities | Government | NGOs |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Government | <ul style="list-style-type: none"> - Community dependency - Lack of participation - Power relations at local levels - Illiteracy - Communal projects | <ul style="list-style-type: none"> -Funding - CBFRM coordination - Technical expertise | <ul style="list-style-type: none"> - Information sharing - Budget transparency -Failure to involve local government - Donor concentration and financing - Approach to participation of communities |
| NGOs | <ul style="list-style-type: none"> - People have more pressing issues - Lack of sustainability - Lack of ownership | <ul style="list-style-type: none"> - Lack of continued involvement - Expectant behaviour - Overreliance on NGOs - Approach to participation of communities - Coordination of CBFRM | <ul style="list-style-type: none"> - Expertise for participation - Documentation management - Project content and a lack of catchment based approaches -Donor driven agendas - Inadequate exist strategies |
| Communities | <ul style="list-style-type: none"> - Lack of resources, training and equipment - Involving community at large - Expectant behaviour of community members - Power relations | <ul style="list-style-type: none"> - Projects do not reflect local needs - Local knowledge disregarded - Lack of participation in project design and implementation - Lack of accountability - Duplication of efforts - 'Lost' promises | |

The challenges are apparent across the spatial scales, from the community to district levels, and beyond. It was revealed that power relations at local levels have a strong influence on who participates in and benefits from the projects, and they are not challenged through CBFRM. Furthermore, the effectiveness of the overall decentralised system for planning and delivery of CBFRM is questioned, from the higher levels (e.g. the relationship between NGOs and donors) to community levels (e.g. lack of information flow between VCPCs and community at large). It was clear that aid-dependency syndrome and a handout culture in communities, created by NGOs and government, present serious issues in the current system. Moreover, the results indicate that CBFRM projects lack sustainability on multiple fronts (e.g. lack of both community and local government involvement in the long term), thus undermining the overall effectiveness of the interventions and undermining ownership.

Notwithstanding some differences, such as the project sustainability issues identified as a challenge by NGOs and government but not by local communities, the findings indicate

that each of the stakeholder groups faces similar challenges. Analysis of the data related to CBFMR challenges highlighted the homogeneity in answers, as evidenced by similar experienced challenges. Furthermore, it was noted that challenges between the two different districts (i.e. Nsanje and Chikwawa) analysed in this study are not distinct, which can be explained by similar flooding experiences and systems in place in the districts (i.e. presence of NGOs, institutional setup). Finally, there was no significant difference identified between the spatial scales (i.e. district of national) of interviewees coming from NGOs and government.

This chapter has provided important contextual understanding for CBFMR in the country, whereas through the next three empirical chapters, the notion of LK will be explored.

Chapter 5- Mapping local knowledge for flood risk management

This chapter unpacks different dimensions of LK for FRM commonly used among communities in the Lower Shire Valley. Findings presented herein predominantly contribute to the second study objective, to identify the range and extent of present LK, thus contributing to the calls from the literature to document LK. Furthermore, the results partly reveal findings related to the third study objective, concerned with how LK is used by the communities, and how it is produced, shared and disseminated.

The chapter starts with identification of different dimensions of LK for FRM (Section 5.1.), thus building a framework upon which the results are presented throughout the chapter. This includes discussion of LK used before, during and after flooding (Section 5.3, Section 5.4 and Section 5.5, respectively) and identifies crosscutting themes (Sections 5.2 and 5.6). Finally, a summary of the chapter is provided in Section 5.7.

5.1 Dimensions of local knowledge for flood risk management

The empirical findings from this study indicate that LK is present across the different stages of the FRM cycle (i.e. before, during and after the flood- phases commonly used in disaster research e.g. Forrest et al. 2018), resulting in a multidimensional and complex knowledge system, conceptually presented in Figure 5.1. The multiple dimensions of LK form a range of strategies, both structural and non-structural, that enable communities to continue residing in areas exposed to frequent flooding. The crosscutting themes presented in Figure 5.1 are apparent across different stages of the FRM cycle and explicitly influence the choice of strategies employed at individual, household and community level during different phases of flooding. The theme '*Knowledge of flood hazard*' will be discussed first as it provides insight into communities' understanding of flood hazard (Section 5.2). Other crosscutting themes will be discussed later on in the chapter (Section 5.6).

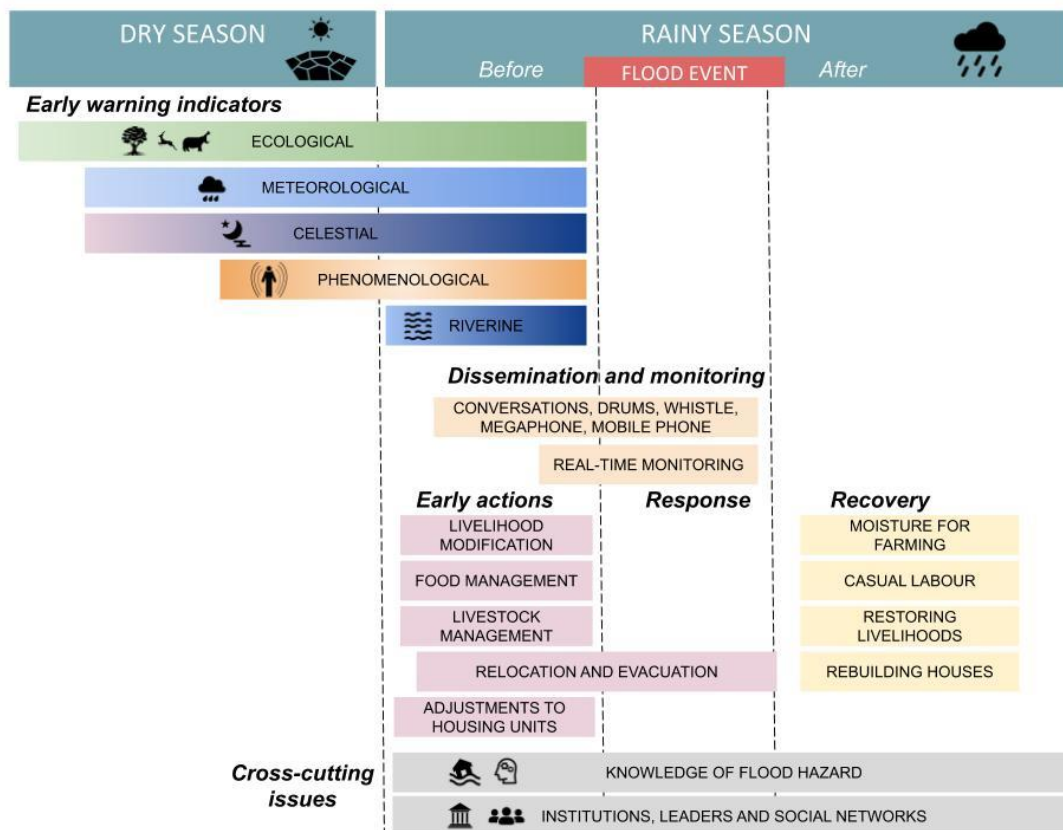


Figure 5.1 Dimensions of local knowledge for flood risk management in Malawi (modified after Šakić Trogrlić et al. 2019)

5.2 Crosscutting theme: knowledge of flood hazard

Across case study communities, generally people demonstrated a thorough understanding of the flood hazard in their localities. This included identification of different types and characteristics of floods, discussion of the causes of flooding as well as detailed description of the perceived changes in flooding over time.

5.2.1 Types of flooding and flood characteristics

As a result of settling in flood prone areas and extensive experience with flooding, communities in the case study areas have developed a comprehensive knowledge base in relation to differentiation between different flooding types and flood characteristics (frequency, duration, and spatial and temporal behaviour).

Generally, communities differentiate between two types of flooding: fluvial flooding from the Shire River and Mwanza River, and flash flooding from smaller streams. Fluvial floods originate from the larger rivers in the catchments, whilst flash flooding occurs in smaller catchments. Both types of floods happen on an annual basis. Participants stated that flash flooding from smaller streams causes significant damage during heavy rains mainly to those residing close the rivers. Fluvial flooding, on the other hand, can cause

severe impacts on a larger spatial scale. In addition to fluvial and flash flooding, communities also emphasised that the flooding situation is worsened when smaller streams (i.e. river tributaries) cannot discharge into the main channel.

Another differentiation emerged through the responses to annual flooding compared with extreme flooding. Participants often regarded annual flooding as beneficial, as it supports farming by leaving residual moisture in the fields. Villagers recalled years in which their communities were impacted by extreme flood events.

'Like we said it floods every year. The annual floods are not so severe. They help with our farming. But the floods of 1997, 1989, 2001 and 2015 have been affecting us severely and we can't forget them.' (FGD Tizola)

This type of information can serve as a valuable data source for creating historical profiles of flood events in the Lower Shire Valley. The flood database in Malawi is maintained by DoDMA at the national level, and some events are documented at district levels. However, the level of detail is low. Therefore, information sourced from local people can greatly contribute with location specific information when planning CBFMR activities in the villages.

Case study communities are flooded during the rainy season, in the months from November to March. Whilst flooding occurs when induced by localised rainfall, it was often pointed out that floods can also occur in the absence of rainfall at local levels, due to rainfall falling in the middle and upper Shire River catchments.

'In this village, whether there are heavy rains or not, floods come because of the amount of rainfall from the uplands. All the water from the uplands comes here.' (F FGD, Kanseche)

This type of flooding causes a situation in which communities are not adequately prepared and contributes to a perception that flooding is unpredictable. Furthermore, participants stated that this type of flood often happens during the night; thus increasing peoples' vulnerability to the negative effects of floods (e.g. houses collapsing while people are inside) and preventing timely evacuations. It was reported by participants that flash flooding from the Ruo River in January 2015 occurred during the night; thus, it is reasonable to infer that the consulted participants were referring to this event, as their most recent experience.



Figure 5.2 A woman in GVH Kanseche indicating water levels during a) extreme flooding, and b) annual flooding

Communities also discussed water heights and flood duration in their respective villages, information that can also contribute to FRM in data scarce countries such as Malawi (e.g. in the setting-up of flood models). They differentiated the heights of flood waters for annual and extreme flooding. Very often, levels were indicated by using local trees or layers of bricks in the houses as measures (Figure 5.2).

Based on the communities' accounts, it was apparent that the duration of floods in the villages depends on flood magnitude (i.e. annual or extreme), and type of flooding (i.e. fluvial or flash floods). Generally, extreme fluvial floods tend to stay in the villages for a prolonged period (e.g. reported up to three months), whereas annual floods and flash floods remain for a shorter period (i.e. days or weeks). However, communities emphasised that floods can occur in cascades, consecutively, thus making a timely return to the village challenging.

'It might take two weeks for the water to start receding. Sometimes you see them receding slowly, and in the morning, it floods again.' (F FGD Kanseche)

Furthermore, participants demonstrated a high level of understanding of the 'dynamics' of flooding in their localities (i.e. the ways in which water arrives in the village and how it spreads). Based on the rainfall intensity and duration, they are able to anticipate how severe the flooding will be. For instance, during the FGD with male participants in GVH Kanseche, it was stated that shorter outbursts of rain indicate flooding of farming fields

and roads, whereas prolonged periods of rainfall signal to the community members that their housing units might be affected as well.

Moreover, participants showed a high level of awareness of differential exposure and vulnerability of the different parts of their communities. For instance, it was repetitively mentioned that households located in the lowlands are the ones more severely affected. In addition, communities in Chikwawa were aware of people in Nsanje, which has a lower topography, being more exposed:

‘When there is too much water here, we know our friends in Nsanje will be in much trouble because all the water goes there.’ (GVH Kanseche, group interview with elderly women)

The knowledge of the spatial distribution of flood water propagation in the villages makes it possible for communities to identify areas within their localities where they can safely evacuate to in the case of emergency. During the female FGD in GVH Misili, the participants pointed out a certain road which delineates the maximum extent of the extreme floods they have experienced. This example indicates that peoples’ knowledge is based on their previous experience, which can demonstrate limitations in the case of a flood magnitude outside of their lived experience.

5.2.2 Flood causes

Participants pointed out a variety of factors and processes perceived as causes of flooding (Table 5.1), indicating that they have a good grasp of the reasons for floods happening in their localities. These included both flood triggers (e.g. rainfall) and conditions that exacerbate flooding (e.g. environmental degradation, population growth). Environmental degradation was identified as the most influential process, both at the local scale (e.g. clearing of land for farming) and at wider spatial scales (e.g. deforestation in the highlands). It was indicated that deforestation is a manifestation of a larger problem in Malawi, poverty, indicating the importance of considering aspects of vulnerability. As narrated by an interviewee (CKII16) from GVH Mbenje:

‘Malawi is a poor country, and people are used to cutting down trees for business purpose. That is why deforestation is very speedy [...] Because of poverty [...] because people collect firewood for business, people cut down trees, selling to rich people, to have cash’.

Another frequently mentioned cause of flooding was siltation of river beds, which essentially decreases the river carrying capacity. In addition, other factors related to hazard characteristics (e.g. rainfall intensity/duration, river network dynamics, backwater

flow), exposure (e.g. geographical location) and vulnerability (e.g. population growth, external interventions) were seen as contributing to flooding, although in a lesser extent compared to environmental degradation and siltation. Very seldom, elderly participants connected floods to supra-natural causes (i.e. Acts of God).

Table 5.1 Causes of flooding as identified by research participants

| Identified cause of flooding | Explanation |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Siltation | Siltation occurring in river beds, thus increasing the elevation of the river beds and decreasing flow capacity |
| Environmental degradation | Flooding occurs due to environmental degradation in the uplands that increases the runoff coefficient in the catchment |
| Population growth | Due to population growth, people have formed settlements and livelihoods in marginalised areas (i.e. next to the river banks) |
| Backwater flow/river confluence | Small streams cannot discharge into larger rivers, since they are at their full carrying capacity, thus causing localised flooding |
| Topography | Settlements and farms in low-lying areas indicating high flood exposure |
| Rainfall intensity and duration | Heavy rains with long duration cause severe flooding |
| Act of God | Floods as a supra-natural phenomenon |
| River network dynamics | New river beds forming gullies causing flash floods |
| External interventions | Local private investor has built a dike to protect their commercial fields thus locally changing flow dynamics and causing flooding in nearby villages. Furthermore, private investor removed vegetation that was decreasing the siltation of the river. |

The results suggest that local people understand the holistic nature of flooding in their villages, caused not merely by waters from nearby rivers, but rather shaped by a complex interplay between underlying vulnerability factors (e.g. poverty) and processes stemming from outside their immediate geographical locations (e.g. environmental degradation, private interests). Furthermore, the fact that people very seldom attributed flooding to Act of God indicate that their knowledge of the natural hazards causes is not limited- the finding which opposes recent findings of Salite (2019b) in Mozambique, and Shah et al. (2018) in Pakistan.

Respondents also described their understanding of the complex interplay between the different causes of flooding; for example, siltation was identified as a result of the type of vegetation clearance that occurs when population growth forces people to settle and farm next to the river bank. This process is further exacerbated by external interventions, such as vegetation clearing and river straightening for private interests. Furthermore, by moving closer to the river banks (i.e. to a different geographical location), people are more vulnerable to flooding that occurs due to backwater flow at river confluences.

5.2.3 *Changes in flooding*

A body of academic literature suggests that floods are on the increase, both on a local and global scale (e.g. Winsemius et al., 2016; Hettiarachchi et al., 2019). However, the interpretations for this increase mainly stem from applying methodologies from physical sciences, thus placing less emphasis on the narratives from flood-affected communities as to whether the floods are changing in their localities.

The analysis of responses indicates that communities in the Lower Shire Valley strongly feel that floods are on the increase, in terms of extents, frequency, and impacts, as evident from the following quotations.

'In the past, the levels would be such that they would just affect the farms and would not reach the village. Now the levels have increased, because now they are coming to the homes of the people.' (research assistant translation during CKII19 Tengani)

'In the past there would be a particular year, we were not always flooded. It would take three to four years without floods. [...] Now, it is worse, there is no specific time. Every year there are floods.' (G11 Kanseche)

'Fifty years ago, the levels of floods were minimum and people were able to evacuate and the level of severity was not that high as compared to the current flooding.' (research assistant translation of CKII25 Nyanga)

According to participants, these changes increase the overall vulnerability, but also prompt different approaches to localised responses to flooding hazards- indicating how local communities exposed to frequent flooding continuously adapt their approaches and incorporate new learnings. When asked about the changes in flooding, the responses demonstrated very little variation between different case studies.

A participant GVH Mbenje, CKII13, elaborated on how the very type of flooding has changed in their community. The participant explained how in the past, they were able to know that floods are coming because waters arrived in the village gradually, whereas now, waters come *'by surprise'* and the whole area is affected within a short timeframe. In several other instances, participants raised a concern that rivers in their villages changed course and/or new smaller streams are created; streams that react faster to

localised rainfall and flood faster. The former indicates that at present, there is an increase in flash flooding in these communities, leading to more adverse and severe impacts.

In addition to identifying the changes in flood characteristics and flood types, by casting their memories of flooding sometimes even several decades back, respondents clearly identified what they perceive as the causes of these changes. In general, what is attributed as causing factors/processes influencing the changes in flooding resonates well with what communities perceived to be causes of flooding, as presented in Section 5.2.2. Yet again, environmental degradation caused by deforestation in the upper catchments, clearing the vegetation next to the river banks and clearing the land for new farms is seen as a major contributing factor to localised changes in flooding. A significant influence of population growth on increasing flood exposure was identified, indicating the issue of settling in marginalised areas. For instance, female FGD participants GVH Mmodzi narrated:

‘The issue is population growth. There is no land for people to cultivate or stay. We are also cutting down trees carelessly and turning them into farms. There were no farms in the hills but now you will find a lot of them.’

When asked about the reasons for changes in flooding, communities also identified a new factor- climate change. During the FGD in GVH Tizola, a participant stated that *‘climate has just changed’*. It was noted that the perception of climate change as an influencing factor for changes in flooding is mainly related to perceived changes in rainfall patterns.

5.3 Local knowledge before the flood

LK used before a flood was found to be more common than LK used during or after the flood. This category is composed of three main components: i) local early warning indicators, ii) early action, and iii) risk reduction strategies.

5.3.1 Local early warning indicators for flooding

Already in the early stages of data collection, it was evident that local early warning (EW) indicators comprise the majority of what communities identify as LK. A vast number of indicators were collected, and a comprehensive overview of all indicators collected during both studies is presented in Appendices 6 and 7, with an overview in Table 5.2. The categories that emerged through thematic analysis of transcripts resemble the classification developed by Acharya and Prakash (2019) for their study on LK in early warning systems (EWS) in India. The explanation of the categories is as follows:

- **Phenomenological:** related to human physical sensations (e.g. hearing, seeing, feeling)
- **Ecological:** related to behaviour of flora and fauna and non-human related behaviours
- **Riverine:** related to behaviours and observations of running water bodies
- **Meteorological:** related to meteorological behaviours (e.g. winds, rainfall, temperatures)
- **Celestial:** related to behaviour of celestial bodies

Table 5.2 Overview and examples of different early warning indicators

| CATEGORIES OF LOCAL SIGNS | EXAMPLE SIGNS | | PERIODS OF OCCURENCE | |
|---------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------|--------------------|
| PHENOMENOLOGICAL | Elderly community members feeling pain in certain body parts | | Before the occurrence of heavy rainfall | |
| | Villagers unable to sleep due to increased temperatures | | August - December | |
| ECOLOGICAL | <i>Fauna</i> | <i>Flora</i> | <i>Fauna</i> | <i>Flora</i> |
| | Increased numbers of ants ('nyerere') in the villages | Tamarind tree ('bwemba') producing an increased number of flowers | July - December | August - December |
| | Animals (e.g. hippos 'mvuu', crocodiles) migrating from the rivers to fields and villages | Increased production of fruits of the mango tree | December - January | July - December |
| | Birds producing a specific sound(e.g. trumpet bird 'n'gombe n'gombe') | Plenty of bamboo ('bende') growing next to the river banks | July - December | November - January |
| METEOROLOGICAL | Rainfall intensity | | October - March | |
| | Strong winds ('mwera') | | September - January | |
| | Rainfall duration | | October - March | |
| | Hot temperatures ('ng'amba') | | August – December | |
| CELESTIAL | Halo around the moon ('chikwa') | | August - January | |
| | Occurrence of orion star ('nthanda') | | October - January | |
| | Full moon ('phanda') | | October – December | |
| RIVERINE | Sound of waters flowing in the river increasing | | December - March | |
| | Colour of waters getting dirty and muddy | | October - January | |
| | Rate of water levels increase | | Shortly before the floods | |

Assigning a timeframe for each of the indicators (i.e. periods of occurrence) proved to be a challenging task, as a high degree of disparity was observed, even within the same village (e.g. individuals reporting indicators being observed in different months). However, generally it was possible to determine whether the indicators observed have a longer or shorter timeframe in relation to the actual flooding events. The indicators falling under the category of 'ecological' were reported as being observed even before the rainy season commences; for instance, certain trees flowering abundantly as early as July. However, in examples of animals migrating from the rivers, community members reported that this mainly happens closer to the occurrence of flooding. Riverine indicators were predominantly observed closer to the actual flooding event. Meteorological indicators are observed predominantly during the rainy season (some occurrences in dry season), with some of them (e.g. increased rainfall intensity and duration of several days) indicating to communities that floods are imminent. Celestial indicators are spread out during the rainy season, with some exceptions (e.g. 'halo' around the moon). The final category of indicators, phenomenological indicators, were reported primarily in the context of an imminent flood and heavy rainfall, but with some instances already before the rainy season.

Even though the indicators were classified into categories for the purpose of this research, in everyday experiences of local people, they are constantly triangulated to form a full image of the possibility of flooding. For instance, in GVH Mbenje, participants pointed out that before heavy rains that will induce flooding, there are heavy winds followed by formation of dark clouds. A key informant from GVH Misili (CKII6) elaborated how hippos, seen as a sign of an upcoming flood, were observed in the village already after the villagers had observed heavy rainfall.

Indicators used to foretell flooding stem from people's close relationship with their surroundings and are embedded in livelihoods and everyday existence. For instance, farmers reported the observation of animal species in the fields; whereas fishermen identified an increased number of specific fish species as a sign of upcoming floods. Furthermore, some of the animal species that were reported as indicating floods are used as a food source; hence their numbers are keenly observed within the community.

'When you see maize is being finished, you dig up the ground and place a basket full of water there and add maize husks that you fried on top. When you go to check in the morning, you find a low a lot of mice, so you know there will be floods, you should be aware. As you eat the

mice, remember you may be killed with the water as well.' (FGD F Mbenje)

Different categories of local EW indicators will be described in more details in the sections below.

5.3.1.1 Phenomenological indicators

Elderly community members reported aching in certain body parts (e.g. teeth, previously sprained ankle) as an indicator of changing weather and arrival of clouds bringing heavy rains. Phenomenological indicators were inferred from the connections with other types of indicators as well. For example, ants, seen as a major ecological indicator, cause troubles for communities, since they are unable to sleep in the houses due to abundance of ants: *'even the hair is eaten up'* (FGD F Mmodzi). Furthermore, increased temperatures and resulting heat (i.e. meteorological indicators) result in individuals sleeping outside their houses and increased sweating.

5.3.1.2 Ecological indicators

Across the case study communities, ecological indicators emerged as the most common. Participants quoted a substantive number of plant species and animals, in this research classified as flora (i.e. plant life) and fauna (i.e. animal life). Ecological indicators have a longer lead-time before the actual flooding, and are used both in the contexts of seasonal rainfall forecasting and occurrence of flooding. The longer lead times are especially applicable for the flora indicators, whereas fauna indicators were reported both in the context of a longer lead time and immediately before an event. It was noted that, when asked if they have any local ways of foretelling flooding in their localities, community members often shared indicators that they see as a sign of heavy rainfall that will eventually lead to flooding.

The abundance of ants (*'nyerere'*, *'lithumbwi'*, *'nthumbwi'*, *'nthendza'*, *'agang'a'*, *'nsungununu'*) emerged as a major indicator across case study communities. Ants are found in abundance in houses and farms, and participants described different type of ants (e.g. red, brown, small, giant). In addition to ants, participants reported different species of insects. Crickets (*'nkhululu'*) are found in abundance both in villages and farms, same as mosquitoes (*'ududzu'*) that bite a lot, caterpillars (*'masande'*) that eat the potato leaves in the farms, termites (*'mphedza'*) that are seen storing the maize underground, and centipedes found around shovels during cultivation. It became evident that the behaviour of different insects is observed as a part of everyday living and tasks. For instance, a

female key informant from GVH Mbenje (CKII15) elaborated how she sees more flies coming to the food while she is cooking, indicating a possible flood.

Another group of animals exhibiting specific behaviour were different species of birds. For instance, some birds produce a specific, prolonged sound (e.g. ‘*ng’ombe ng’ombe*’ – trumpet bird, ‘*tangwe*’ bird), other species are found in abundance and destroy yields in the fields (e.g. ‘*janjo*’ bird), while some species were reported to migrate from the rivers to the villages (‘*akakowa*’ birds- storks). The migratory behaviour of animals was seen as a sign of upcoming floods in many instances. Communities gave examples of hippos (‘*mvuu*’), crocodiles, rats (‘*mbewa*’), mice, tortoise (‘*kamba*’), storks (‘*akakowa*’), and large ducks (‘*matsekwe*’); all leaving the rivers and river banks and coming to the villages through farms. Interestingly, it was noted how some of the migrating animals indicate not only the occurrence of flooding, but also the actual flood extent.

‘Hippos move from the marshes to the uplands so we know that where the hippo reached, that is where water will reach as well.’ (FGD ACPC Tengeru)

In addition to different species found in increased numbers, producing specific sounds or exhibiting migratory behaviours, during data collection, a variety of different behaviours across various species was reported. For instance, pigeons are found making nests in a specific direction, ducks (‘*bakha*’) and cattle (‘*ng’omba*’) show signs of unrest and excitement, rats (‘*mbewa*’) and snails (‘*nkhono*’) climb the trees, antelopes are seen leaving the forests, and big snakes pass through maize fields and leave marks.

Furthermore, another widely mentioned ecological indicator was different species of trees (Figure 5.3). The reported tree species were described as either producing an increased number of flowers (e.g. ‘*mfungo*’ tree, ‘*nkhuu*’ tree, ‘*mkotamo*’ – bushwillow tree) or an increased number of fruits (e.g. ‘*nyenza*’ tree, mango tree, ‘*mbwemba*’ – baobab tree). In addition, it was mentioned how water hyacinth plants (‘*namasupuni*’) will be found in abundance, similar to plenty of bamboo (‘*bande*’) next to the river banks.

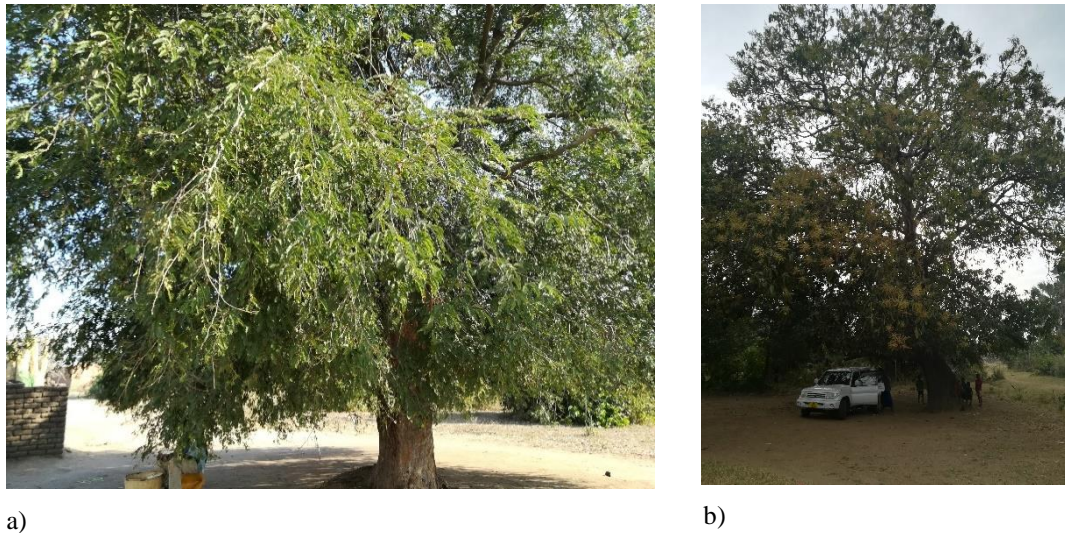


Figure 5.3 Example of trees used as local indicators (author's own, June and July 2017): a) Nyanga tree in GVH Misili, b) Mango tree in GVH Kanseche

5.3.1.3 Riverine indicators

Communities described riverine indicators as the most reliable sign of an upcoming flood, due to its short lead-time prior to immediate flooding. People in the Lower Shire Valley have a close relationship with a river, due to the interdependence between their primary livelihoods (i.e. farming and fishing) and alluvial fertile soils supplied through river-floodplain interaction. Therefore, they observe the waters in the rivers, and based on the observations, make inference of what is to come. In the study sites, participants described how waters in the river change colour, are dirtier and muddier as the water level rise (due to increased debris content), how the river has an odour, and foam can be observed on the surface. Waters were also described as being of increased velocity, producing sounds, and community members indicated rising water levels are a clear indication of an upcoming flood.

'The water that always flows in this river is clear so the water that comes because it has rained in the uplands, we see it rising and even reaching our farms. We then know that it has rained in the uplands and it will flood here. The water is so dirty.' (FGD F Misili)

5.3.1.4 Meteorological indicators

Meteorological indicators included observations of rainfall patterns, duration and intensity, changes in air temperatures, occurrence of strong winds and whirlwinds and formation of specific clouds. People observe the majority of these indicators during the rainy season (e.g. thick clouds, intense rainfall); however, some are observed even in the 'cold' months (e.g. frequent blowing of winds and whirlwinds).

The Lower Shire Valley, with its sub-tropical climate, is the warmest part of Malawi. Very hot temperatures (*'ng'amba'*) emerged as one of the main meteorological indicators. Warm temperatures are observed in the rainy season, they foretell heavy rains, and have a strong phenomenological component, since people are unable to sleep in their houses due to heat.

'Another way is that there is a lot of heat from the Sun. The heat can last from early morning up to around 4 PM, even up to later in night. We sleep outside. We know that there will be problems that year.' (FGD Tizola)

Another sub-group of meteorological indicators was wind-related. Participants mentioned heavy winds (*'mphepo'*, *'bangula'*, *'mwera'*) bringing dust and causing damage to roofs, increased occurrence of whirlwinds (*'kavuluvula'*) and frequent blowing of winds (*'kuzizila'*). Depending on the community, wind direction, both southern and northern was seen as an indication of heavy rains. This difference between communities points to the context-specific nature of LK, even in the communities that are relatively close. In some instances, occurrence of heavy fog (*'nkhungu'*) at the top of the mountains was an indicator of heavy rainfall; same as heavy thunderstorms in the east and west; and occurrence of dark (*'mitambmo yakunda'*) clouds.

Rainfall-related changes and observations make for another sub-group of meteorological indicators. According to research participants, changes in rainfall at the local level are continuously monitored- especially rainfall intensity and duration. This observation of rainfall changes can be explained by people's reliance on agriculture. Heavy rainfall falling for a prolonged time is interpreted as a warning for an upcoming flood. It is evident that observations of rainfall have shorter timeframes in relation to the actual flood occurrence. Furthermore, in GVH Mbenje, changes in rainfall timing were seen as a sign of season in which floods will be experienced. Depending on whether the rains were early or late-onset rains, participants saw it as a sign of flooding. However, there was no consensus between participants on whether the early or late onset indicates flooding.

5.3.1.5 Celestial indicators

In comparison with other categories (except phenomenological indicators) celestial indicators were more rarely mentioned and serve primarily as an indication of heavy rainfall and good harvest. Research participants mentioned concentric rings around the moon – a 'halo' (*'chikwa'*, *'nkhokwe'*); the brightness of stars (*'nyenyezi'*); full moon

(‘*phanda*’); redness and increased intensity of the Sun (‘*dzuwa*’). Celestial indicators are primarily observed during the rainy season.

5.3.1.6 Observation and sharing of early warning indicators

In order to enable action and fully deliver benefits through tangibly reducing impacts on the ground, local early warning information needs to be appropriately disseminated and shared among community members. Data indicate that the local indicators elaborated in previous sections are shared predominantly in an informal manner, in addition to more formal channels of dissemination. The informal manner is vital even in the presence of formal dissemination and communication.

Since local indicators predominantly stem from people’s surrounding environment, research participants elaborated that there is no specific person responsible for monitoring the indicators. As explained by an ACPC member during the FGD in TA Maseya:

‘Everyone observes the ants and they know that there will be floods. There are ants in every house so everyone knows.’

This statement indicates that local signs are primarily observed at the individual and household levels. A similar example was provided by a female FGD participant in GVH Kanseche:

‘Everyone will notice these [local signs] as they walk and in their homes. You might see a porcupine right where we are seated, or your child might pick one up. Then you know there will be a lot of water.’

Therefore, it is evident that people observe LK indicators while engaging in their everyday activities. Furthermore, the importance of the household level was also emphasised in relation to it being a prime ‘platform’ not only for sharing LK but also learning about it (i.e. intergenerational knowledge transmission).

‘When we sit down with the kids, this is what we say [...]:When we see 'nkhululu' just know there will be floods. When we see ants in the earth pots just know there's water. There will be heavy floods that will shake you, we even lose people, goats and chickens are lost. [...]. We teach the child so that they know since you can't tell when you die.’
(FGD Tizolo)

Upon observation of different indicators, people share them between themselves in an informal manner. For instance, participants explained how they will ‘chat’ about this, within their household and with neighbours.

'It just happens that as you are chatting, you will discuss these things [local early warning signs], that what do you think? There will be heavy rains this year, have you seen it? Others, they will call you and say have you seen how it has borne fruit? And you also see that it is so.'
(FGD M Kanseche)

While discussing which individuals within the community play an important role when it comes to sharing LK, the role of elderly community members was emphasised as instrumental both in observing the indicators, as well as in sharing with fellow community members. Again, a male FGD participant from GVH Kanseche elaborated:

'Maybe you have gone to their [elderly person] home, as you chat they tell you that there will be a lot of water because of trees that have borne a lot of fruit [...] They promise us and we see that it has happened. Because they have observed these things for long.'

Elderly people were identified as main custodians of the LK, due to their long-lasting experience with flooding. However, the results indicate that this valuable source of information is not utilised to its full potential. For instance, a female elderly key informant from GVH Misili (CKII4) pointed out how despite the fact that she is able to interpret the signs, she is not consulted by community leaders or VCPCs, and shares it only with her household members. Taking into account that VCPCs are supposed to be the core connection between community at large and external stakeholders (i.e. NGOs and government) implementing CBFMR, this indicates the current underutilisation of LK in CBFMR, which will be thoroughly discussed in Chapter 7.

In addition to informal conversation within households and neighbours, local EW indicators are also informally shared in community gatherings, such as during religious ceremonies, funerals, and different community-group meetings (e.g. farmers, women). Understanding that within their communities people share information informally, either through conversations or through community gatherings can serve as a valuable input for improving the dissemination of official warning information; for instance, stakeholders working with communities should encourage community members to use any opportunity they have to share official warnings.

Informal dissemination and communication primarily emerged as an answer to a question of whether there are some community meetings to share the signs. In some cases (e.g. GVH Misili, GVH Mmodzi, GVH Nyang'a), participants explained that community meetings might be organised where signs will be shared and people living in the most flood prone areas (i.e. in the lowlands) advised to relocate to the uplands. Meetings are

jointly organised by the chiefs and VCPCs. For instance, female FGD in GVH Misili participants explained:

‘When they go to the farms and see the frogs, the hippos have destroyed the sweet potatoes, they [VCPC] call for a meeting. The VCPC will call for the meeting and tell the GVH or their advisor to announce on the meeting what everyone else is seeing, and that we should evacuate to the uplands.’

However, even though local signs are one of the reasons for the initiation of the meetings, they are not the sole reason. The results indicate that meetings are organised in a complex interplay between locally sourced information and official warning coming to communities through different communication channels (e.g. radios, NGOs, district government staff).

‘Some NGOs come telling us that this time you should hold meetings, warning the people that we are in flood prone areas. Sometimes we just decide based on the way we’ve seen the season that we should hold meetings to warn people to be prepared.’ (FGD M Mmodzi)

This indicates that in a setting such as Lower Shire Valley, where communities have a rich LK and there is a strong concentration of development initiatives focusing on disaster resilience building, community action is based on a triangulation process between different sources of information. It also indicates that externally introduced intervention (i.e. the establishment of the VCPC) added another layer to the already existing practices of LK sharing.

Whilst sharing of LK and dissemination of LK is clearly important, it is not effective unless it leads to early action, since transforming knowledge to action leads to better preparedness and can essentially decrease flood impacts and losses. Therefore, it was important to explore whether this type of early action initiatives are found in the case-study communities. This is presented in the following section.

5.3.2 Early action

The term early action in this research refers to the strategies taken by individuals and communities to prepare for and minimise the impacts of floods upon observing local early warning indicators. A range of strategies that can be classified as early action were identified, covering both coping (i.e. short term local adjustments, risk absorption) and adaptation (i.e. longer term local changes, risk reduction) strategies (van den Homberg and McQuistan 2019). The diversity of strategies found within the case study communities indicates that local people can do much to reduce the negative impacts of

floods, and across the case studies participants stated that those who act proactively are the ones less affected by floods. It is important to emphasise that the findings indicate that early action at the local level is based not only on local EW indicators, but rather on an informal triangulation process between locally observed indicators and official information reaching the communities. This points out the hybrid nature of LK and the fact that it is constantly evolving as it intertwines with a new information and experience, which will be discussed in detail in Chapter 6. A summary of the various early action categories is presented in Table 5.3, with a more detailed explanation provided in the sections below.

Table 5.3 Overview of early action categories

| Categories of early action | Examples |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Livelihood modification | <ul style="list-style-type: none"> • Farming both in the lowlands and uplands • Renting farming plots in the uplands • Storing extra seeds for replanting after the floods • Planting earlier in the season |
| Food management | <ul style="list-style-type: none"> • Heading to the maize mills prior to the rainy season • Storing extra food • Keeping food on a raised platform inside the houses (<i>'khungu'</i>, <i>'nsanja'</i>, <i>'tandala'</i>) • Moving food reserves to houses in uplands |
| Livestock management | <ul style="list-style-type: none"> • Moving livestock to the uplands • Not allowing livestock to graze next to the river banks • Constructing raised platforms for goats and chickens (<i>'kraal'</i>) |
| Relocation, early evacuation and temporary shelters | <ul style="list-style-type: none"> • Looking for land in uplands to temporarily relocate • Constructing raised platforms in the lowlands (<i>'chete'</i>, <i>'thandala'</i>, <i>'nsanja'</i>) • Constructing temporary shelters in the uplands (<i>'makumbi'</i>) • Preparing schools and churches in the uplands to be used as temporary shelters |
| Adjustments to housing units | <ul style="list-style-type: none"> • Digging the drains around the houses • Thatching the houses with grass • Incorporating plastic sheets inside the roofing system • Building temporary dikes • Adding a layer of cement on the walls of houses made out of burnt bricks • Foundation strengthening with adding a layer of soil and mud (<i>'chiguwa'</i>) |

5.3.2.1 Livelihood modification

One of the most severe impacts of flooding in the Lower Shire Valley is in relation to farming. As a way to minimise the negative flood impacts on yields, several strategies are implemented. For instance, some farmers opt to plant maize, cotton, millet and Irish

potatoes earlier in the season, in order to be able to harvest before floods affect their fields. Other examples included keeping more seed in order to re-plant after the floods and renting farming plots in the uplands.

In several cases, participants explained that some people own farms and houses both in the uplands and lowlands, thereby securing yields regardless of the environmental conditions.

'We have other farms in the uplands, others in the lowlands so we know that we will waste time to cultivate in the lowland because of the floods that year. We leave those farms and work on the ones in the uplands.'
(FGD M Kanseche)

This example indicates how people exposed to a recurrent threat, have come up, based on their LK, with an innovative approach that helped them to adapt.

5.3.2.2 Food management

Different methods of food storage was another common answer when asked about the early action activities. Harvested food is either stored in bags to prevent moisture (e.g. GVH Kamanga), in temporary accommodation built in the uplands (e.g. GVH Misili), or in second houses some community members own in the uplands (e.g. GVH Mbenje).

An interesting example was provided in GVH Kanseche, where people explained that they go to the maize mills in advance, in order to have food readily available during the times of flooding, when the road infrastructure might be cut-off and their mobility reduced.

'We prepare because we know that we may stay a long time with little mobility, so we prepare maize flour. Because maize mills are far, we go early so that we are not stranded when floods come because it is hard to buy food.' (FGD M Kanseche)

Additionally, participants in several instances described how inside their houses, they will build a raised platform where the food will be kept. Depending on the village, this platform is called '*khunguku*' (e.g. GVH Nyanga), '*thandala*' (e.g. GVH Mmodzi) or '*sanja*' (e.g. GVH Chapinga).

5.3.2.3 Livestock management

In the Lower Shire Valley, livestock is an important capital at the local level, and flooding affecting this valuable asset presents an issue. Owning livestock increases individual's and household's capacity to deal with losses, since animals can be sold after the flooding

event, thus generating additional income and ensuring faster recovery. Owning cattle in the Lower Shire Valley is a matter of prestige and a demonstration of wealth (Chawawa 2018).



a)



b)

Figure 5.4 Example of livestock management strategies a) 'Kraal' for chicken in GVH Tengani, and b) raised platform for goats in GVH Kanseche (source: authors' own, June and July 2017)

People construct raised platforms ('*kraals*') for goats and chickens, to keep them safe during the floods (Figure 5.4). In addition, in several instances, it was mentioned that goats and chickens stay with people on the raised platforms (to be explained in detail later on in this section). Upon observing that water levels in the river are rising, community members avoid cattle grazing next to the river banks, to keep them safe from flooding and possible crocodile attacks.

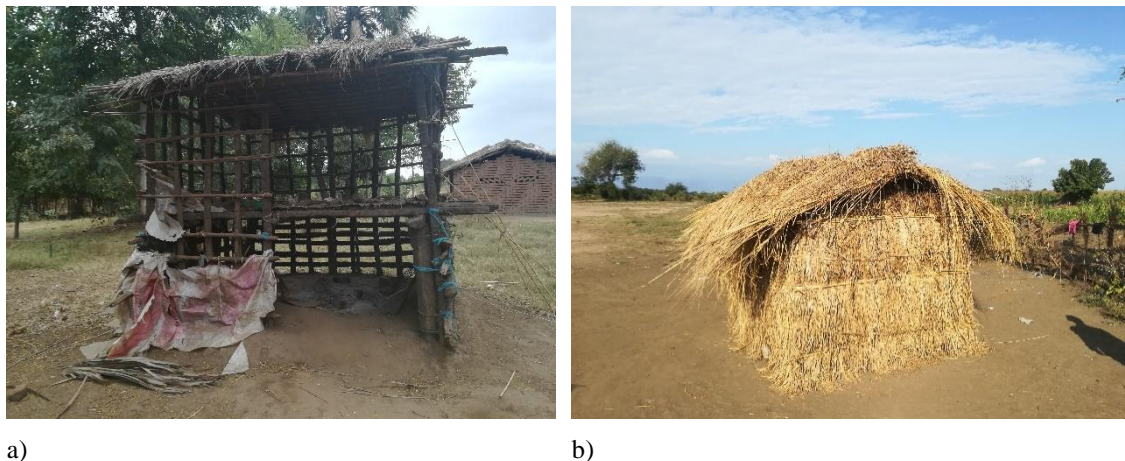
Additionally, those who decide to temporarily relocate to the uplands will also move their livestock. However, as mentioned by a woman during FGD in GVH Misili, this is not always the case, since it might be difficult to secure a space for grazing in the uplands; hence, men will stay in the lowlands and take care of cattle.

5.3.2.4 Relocation, early evacuation and temporary shelters

Throughout data collection activities, when asked about early action, participants focused primarily on the process of early evacuation and temporary relocation to shelters located in the uplands (i.e. areas safe from flooding). According to local communities, temporary shelters are prepared in advance. In some instances, it was explained how women, children and smaller livestock might relocate, while men will stay in the flood prone

areas, keeping the houses and belongings safe and monitoring the situation. The process of preparing the temporary shelters starts upon observing heavy rainfall and/or once when villagers observe water levels increasing.

Generally, community members explained how early evacuation and relocation is done to the following types of structures: temporary shelters (*'makumbi'*), raised platforms (*'chete'*, *'thandala'*, *'nsanja'*), to the second housing units owned by some community members in the uplands, rented houses in the uplands, and existing evacuation centres. Examples of *'makumbis'* and *'thandalas'* are presented in Figure 5.5. Upon observing local early warnings indicators and interrelating it with messages received through official sources (again, demonstrating the triangulation aspect), some of the people living in the flood prone areas will decide to start preparing temporary shelters and moving with their belongings (e.g. kitchen utensils, maize flour) and livestock.



a)

b)

Figure 5.5 Example of temporary shelters used for early evacuation and relocation: a) raised platform in GVH Kanseche, and b) temporary shelter in GVH Misili (source: authors' own June 2017)

Raised platforms are located on high ground in the lowlands (i.e. flood prone areas), and constructed by using local materials, with a height corresponding to the water levels previous floods reached, indicating how LK is produced based on previous experience. As explained during the group interview in GVH Kanseche (GI-2):

'We prepare them [raised platforms] knowing that water might go beyond a certain level so we build it higher than that level.'

Raised platforms are structures where whole families, together with some livestock, reside in times of anticipated flooding or during floods.

'Some men will look for uphill, level them off and prepare so that when floods come they should just carry their children to the uphill. Some women will get the soil and plaster the platforms so that when floods come, they should just get on it with their children.' (FGD F Kanseche)

In addition to raised platforms, other type of temporary shelters, '*makumbi*', are built in the uplands. Men from GVH Misili explained that they are built using trees as a structural support, walls out of grass and thatched roofs, indicating the role of locally-sourced materials. Similar to raised platforms, those who temporarily relocate to '*makumbi*', do so upon observing the rains, as narrated by a key informant from GVH Misili (CKII2):

'He is saying that after observing the signs, they will wait to see how it is actually raining, and that is mostly in end November, December. That is when they will, looking at the intensity of rainfall, that is when they start to see whether they should move and build shelters.' (research assistant translation)

'*Makumbi*' was perceived as especially useful by community members, as apparent from the following example:

'We are now clever, we have opened our eyes, when it's nearly that time we evacuate children and elderly women to the uplands. November, December, everyone is in the uplands. We look for a place for people and build makumbi so people can stay there.' (FGD F Mbenje)

In this specific instance, under '*we have opened our eyes*', the participant was referring to a change after their community was heavily affected by floods of 2015. This indicates that the events of extreme magnitude can serve as a 'trigger' to adhere to already existing LK. However, a key informant from GVH Nyang'a (CKII27) provided a slightly different perspective. Although their village was also heavily hit by 2015 floods, they explained that they will build the '*makumbi*' in advance, upon observing the rains, but will move only when the waters start coming, since their livelihoods are in the lowlands.

5.3.2.5 Adjustments to housing units

Another aspect of LK as early action was evident the way communities explained how houses are strengthened. As explained in GVH Misili, strengthening is done upon the start of the rainy season. The key informant from GVH Mmodzi (CKII8) elaborated how houses might fall during the heavy rains, so the people living in the houses made out of mud bricks will purchase plastic to incorporate into the roofing system. In GVH Karonga, it was further explained how next to incorporating plastic, more grass will be added to the roof. Owners of the houses made out of burnt bricks might add layers of cement on the walls, to serve as a protection. During the FGD with women in GVH Nyanga, participants

described that openings in the walls of the houses will be made so that once when the floods arrive, water can flow freely and leave the house. Additionally, across case study communities, the researcher observed what communities call ‘*chiguwa*’ or ‘*guwa*’: a form of foundation strengthening with mud and soil. An interviewee CKII19 in GVH Mmodzi and participants in an FGD with women in GVH Tengani mentioned drains built around the houses for the purpose of collecting water. Examples of some of these practices are presented in Figure 5.6.

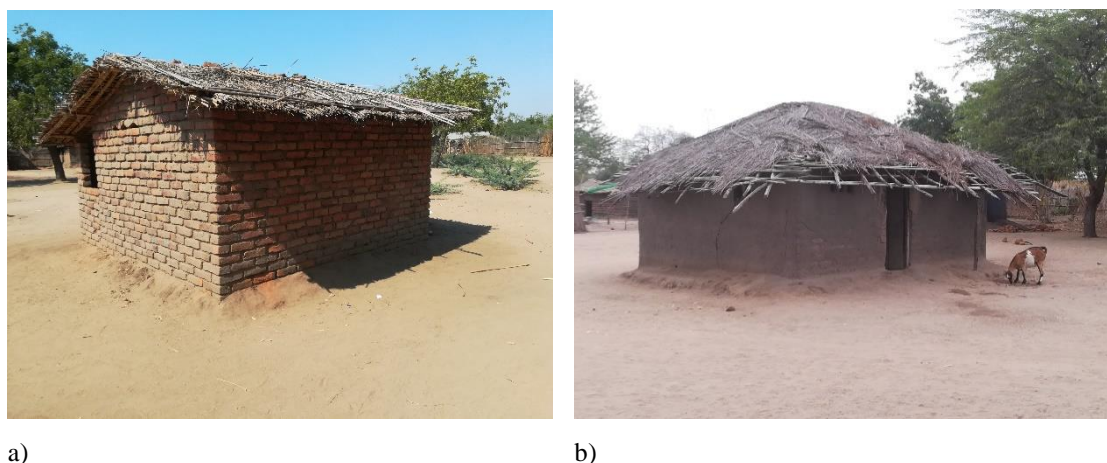


Figure 5.6 Typical houses in the Lower Shire Valley a) a house built with burnt bricks in GVH Misili, and b) a house in GVH Tizola built with mud bricks, also showing the '*chiguwa*' surrounding the foundations (source: authors' own June 2017)

In addition to early action strategies described throughout this section, the research documented several other types of strategies. These are discussed in the following section.

5.3.3 Risk reduction strategies

While early action strategies described in the previous section were based on actions taken based on the observation of local EW indicators, participants also discussed strategies they employ irrespective of EW indicators, but rather as a way to reduce their risk. The types of strategies discussed included adaptations to properties, local spatial planning and the reinforcement of soils and river banks.

Firstly, at the property (i.e. household) level, there were several measures aimed at making the houses more robust and resilient to floods. As opposed to the ‘*ad hoc*’ house strengthening described in the previous section, these present more strategic approaches to more resilient construction. Improvement to foundations was the most commonly reported measure, dependent on the housing type (Figure 5.7). Houses made out of burnt

bricks generally have a raised foundation, whereas mud brick houses will have a previously discussed ‘*chiguwa*’ – soil plastered to strengthen the foundation. Houses with the raised foundations are commonly found in the lowlands, raised to the levels based on previous experience.

In GVH Kanseche, both FGD participants and interviewees explained how the practice of local construction evolved to create structures more resilient to flooding.

‘At first we use to build houses plastered with mud. When the water came, they would destroy that ones. Until some time back, we would still do that. When they fell, we would cut trees, build another one and plaster it with mud again. When people saw that it was not working, people started moulding blocks, they would follow the level of water and see that they should raise it by that much. That is why you see these raised foundations, that maybe we can be helped.’ (GI-2 Kanseche)

This suggests the dynamic and evolving nature of LK, where people continuously experiment, and based on that, come up with improved strategies.



a)



b)

Figure 5.7 Example property level flood protection: a) reinforcement of foundations in GVH Mmodzi, and b) a house in GVH Misili with a raised foundation , (authors' own, June 2017)

Other examples of measures implemented at the property level included: i) orientating the houses in a way that the entrance is opposite of the direction from which rain falls; ii) using palm trees during construction to reinforce the walls; iii) filling empty sacks with sand and placing them around the house as a physical barrier to water; iv) making a roof with two-sided slope (‘*lamada*’); v) digging drains and ditches around the house (reported effective for annual flooding); and vi) reinforcing the foundations with stones.

Secondly, in the context of local planning, in several instances and based on people’s previous experience with flooding, it was mentioned that those living in the flood prone areas will leave the ‘buffer’ zone between their farms and a river (8-10 meters), thus

making space for the river and not disrupting the floodplain. Similar ideas were brought out by a key informant CKII19 from GVH Tengani, who explained that some build houses a distance of approximately 150 meters away from the river. This indicates that, in some cases, local people have developed their own version of flood zoning.

Finally, several methods to prevent sedimentation of rivers were shared. Participants mentioned the construction of a physical barrier at the edge of the farms in order to prevent sediment from reaching the river, planting of trees, Napier grass, elephant grass, reeds and shrubs along the river to enforce the soil and prevent erosion. Additionally, in GVH Mmodzi, villagers constructed check dams and dikes made out of local materials to control the flow of the water and manage erosion processes (Figure 5.8).



a)



b)

Figure 5.8 Examples of river protection works from GVH Mmodzi: 1) check dams, and b) a dyke (authors' own June 2017)

This section gave a complete overview of LK used before the flood. The following part will present LK which communities in the Lower Shire Valley use once when they face a flood event.

5.4 Local knowledge for during the flood

5.4.1 Evacuation means and location

Previously (Section 5.3.2.4), it was explained how some community members make the decision to evacuate early and temporarily relocate. However, others evacuate during the flood event. Due to the study approach (i.e. qualitative), it was not conclusive whether more people evacuate early or wait for the waters to come. However, it was an impression of the researcher that more people wait for the waters to arrive. This section explores the

common means by which and places where people in the Lower Shire Valley evacuate, and explores the factors prompting them to evacuate.

Canoes carved from locally available trees emerged as the most common evacuation method (Figure 5.9a). These canoes are commonly owned by fisherman living in the lowlands, and as emphasised, they are individually owned and not community property. It was explained that canoes can also be borrowed from friends, relatives or from a neighbouring village. Canoes are used for urgent evacuation of individuals and families, and it is not common to carry household property; as mentioned in the GVH Mbenje *‘we don’t bring along anything because it is an emergency’* (FGD F). Conditions in the canoes are not always ideal:

‘If we take long to evacuate we use canoes, but it’s under bad conditions. Children are at your back and wet from rains because the rains are falling heavily. You carry nothing, canoes are full of snakes and even mice are there as well.’ (FGD F Mbenje)

It was apparent that communities prioritise imminent saving of lives. The fact that property and livestock are lost demonstrates the drawback of not taking preparedness measures and early action, and calls for approaches that would reinforce anticipatory action within communities.

Next to canoes, participants also mentioned wooden boats with no engines. Other means of evacuation include walking, using ox-carts and bicycles and climbing the nearest tree. In several instances, participants explained how they might use locally available materials, such as banana trunks, reeds or grass doors as a way to evacuate with the flowing water. In GVH Mbenje, an example was given of using a water plant called *‘zikinde’*, on which an individual can climb and be taken by the water to the nearest anthill or a tree. The use of locally available materials for evacuation indicates that when faced with an imminent flood, people resort to any available means to get to safety.

Some community members will evacuate either to pre-built shelters or will build them on arrival (*‘makumbi’*). In many instances, participants elaborated how they relocate to schools, churches and tents provided by NGOs. The relocation to schools is problematic, as it disrupts the provision of educational services. Furthermore, in some places, permanent structures for evacuation have been built (e.g. mentioned in GVH Tengani). Moreover, more informal evacuation locations were mentioned, such as trees and anthills

(Figure 5.9b). Some will seek shelter in neighbouring villages. In GVH Mmodzi, a key informant CKIII1 pointed out that the government allocated a piece of land where people can evacuate.

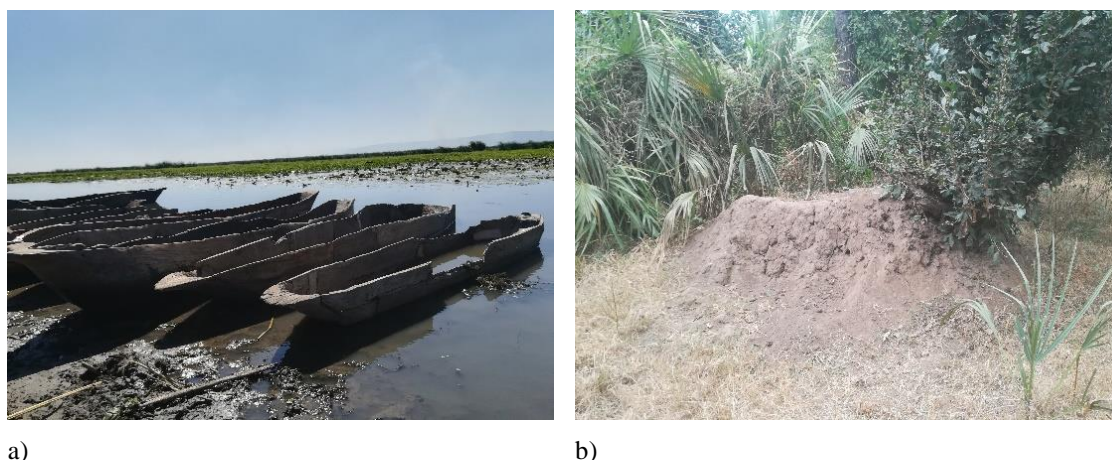


Figure 5.9 a) Canoes in GVH Nyanga b) Anthill in GVH Kanseche (Author's own: June and July 2017)

5.4.2 Monitoring, dissemination and the decision to evacuate

Based on the collected data, an integral part of LK used during the floods are creative ways used by community members to monitor the local situation in real time, and based on observations, disseminate the message and finally, make a decision to evacuate.

Monitoring mainly referred to individuals observing the water levels. The findings and descriptions in this part resemble what was previously described under the category of riverine early warning indicators (Section 5.3.1.3). Across case study areas, participants described how they closely monitor the levels of waters in the rivers. This included observing the rate of increase in water levels (most commonly), debris content, colour of waters, foaming and sound that water makes. The observations are another indication of the embeddedness of LK in everyday existence of community members. An interesting narrative was provided by a fisherman in GVH Nyanga:

'Being a fisherman, being in the community where most of the people are fisherman, when they go fishing, especially in the Shire River, they are observing the speed of water, even the colour and weeds it carries.'
(research assistant translation during CKII27)

In many instances, participants explained how locally, they use reeds (i.e. a straight branch of tree or a bamboo stick) to measure the water levels; and based on the readings, they will make a decision to leave their homes. This is done once when the rivers are

already at their full carrying capacity, and people see that floods might come anytime. The procedure of using the reeds is explained in a following excerpt from an FGD:

Person 1: *When water is coming we take a reed, maybe one meter long and place where the water is starting and then you go home. In the morning we come back to check if water is increasing or not. If we see that it is increasing we know that floods are coming. If it is decreasing we know it because they [water] leave a mark.*

Person 2: *Just to add, water also goes beyond where the reed was placed so you take another one and position it on the new mark.*

Person 1: *When we observe we tell the chief that water is coming and he will tell his people that floods are coming so let's evacuate.'* (excerpt from FGD M Mbenje)

As evident, this type of practice can be effective in a case of a fluvial (i.e. riverine) flood, since these floods usually come more gradually. However, the effectiveness of this type of practice for flash floods is limited, as flash floods are characterised by fast occurrence.

In GVH Misili, GVH Tengani and GVH Tizola, participants explained that situation is monitored by using community-based early warning systems (CB-EWS) installed by NGOs. As explained by a key informant CKII18 from GVH Tengani, community members still use reeds, and triangulate the information between the reeds and readings from CB-EWS. This exemplifies how LK in the Lower Shire Valley is a dynamic concept, constantly redefined and merged with external practices into a new, 'hybrid' type of knowledge. It also points out that local people are active learners and experimentalists.

In terms of information dissemination, similar to local EW indicators, the information will be informally disseminated between community members through conversation. Furthermore, whistles, drums, and megaphones are common communication means. Drums are beaten in a specific manner, and according to participants, community members are aware of the meaning of this specific beat.

5.4.3 Other local strategies employed during the flood

Several other practices that did not fit into the themes described above were documented. For instance, in GVH Tizola and GVH Mbenje, participants explained how, in the case a person is hurt, reeds are weaved around the tree branches and cloth is placed in the middle, so that a hurt individual can be transported to the hospital. Further, in GVH Kanseche it was mentioned how once when they have already evacuated, they will use canoes to go

to the closest maize mill and purchase food. Finally, participants in GVH Mmodzi and GVH Misili explained how, when the flooding is imminent in the village, they will take some last minute efforts to protect their houses, by constructing dikes (by piling up the stones or filling in the sandbags) or digging up ditches to divert the flow of water.

The results presented throughout this section described the diversity of LK people use during the flood. In the following section, LK used after the flood will be presented.

5.5 Local knowledge for after the flood

LK used after flooding primarily consists of strategies that are employed by local communities to rebuild damaged houses, restore livelihoods, and other strategies to aid recovery.

Empirical findings show that most commonly, houses are rebuilt at the same locations, with marginal or no improvements in methods of construction for several reasons. Firstly, participants explained that once when the house has fallen, the ground is raised, and they will rebuild the house on the same spot, since houses on elevated grounds are perceived to be more flood resilient, as they are on a higher elevation. Secondly, the decision to build on the same spot is influenced by availability of land. In GVH Kanseche, FGD participants explained that in order to build on a new location, traditional leaders (i.e. chiefs) need to allocate the land. In GVH Mmodzi it was mentioned that one might use a plot that belonged to parents or relatives. However, in GVH Nyanga, a participant during the female FGD provided an interesting insight when recalling the 2015 floods when the land for new settlements was allocated by the chiefs:

'In 2015, people were allocated land but the owners of the land chased them away saying that their land can't be given to others. You should give us money. [...] The owners would ask where they will farm if people are occupying their farm lands.'

As this example suggests, land availability might present an issue. Furthermore, in GVH Mmodzi participants explained that even if one decides to build a new house on slightly higher ground in the lowlands, depending on the magnitude of floods, the new house might be affected, pointing out to the limits of LK in the light of unknown. Finally, in GVH Tizola, it was described that access to fertile farming land serves as a motive for people to rebuild houses in the flood prone areas, and they will be severely affected only during extreme floods. This suggests that people, depending on farming in flood prone

areas as a livelihood, are in the trade-off between floodplains as an opportunity and living in a floodplain as a threat.

Another strategy commonly mentioned was building temporary shelters (i.e. '*makumbi*') in the flood prone areas, while waiting to rebuild the affected houses or '*until you find money to construct another house*' (FGD F Nyanga). As identified during the group interview with elderly females in GVH Kanseche (GI-1), it is a priority to go back to farms and use the advantage of residual moisture, so they '*rush to the fields without worrying about the permanent houses*'. Interestingly, one participant from GVH Nyanga (CKII25) explained that they and some other community members opted to permanently reside in what is classified as a temporary house, since they are aware that floods might affect their houses every year. Hence, it is easier to permanently live in the house made out of locally available materials at no cost. In terms of housing, it was also repeatedly mentioned that after the floods have receded, people first clean the mud from the houses that did not fall and make openings in the walls in order to accelerate the drying process.

The priority for community members in the Lower Shire Valley after the floods is to plant the farms located in the flood prone areas in order to secure food. Their sources of income and livelihood options are limited; hence, they place most importance on going back to activities that will provide them with living. As repeatedly mentioned across case study communities, people will make use of residual moisture and plant seeds (e.g. maize, beans, rice). After the floods have receded, people will wait for the mud to dry up, then prepare their fields and plant.

After the floods have receded, communities find it challenging to recover, as evident from the following quote:

'Life gets back to normal but it is hard since a lot of things have been damaged. It takes time for things to normalise.' (FGD F Kanseche)

Replacing the losses, especially the livestock, is difficult task with high levels of poverty. In order to generate income and recover faster, across the case study areas it was reported that individuals get involved in casual labour by working in other peoples' farms. Through this activity, they earn funds for recovering faster (e.g. for buying seeds to plant the fields).

Before NGOs and government come to the village with relief aid, communities rely on each other. Female participants from GVH Kanseche explained how those who have lost their food will buy small portions of food from other community members, to sustain themselves before the help arrives.

With this section, the overview of dimensions of LK across FRM cycle (i.e. before, during and after) has been provided. Throughout previous sections, the data presented implied that local leaders and institutions, as well as social networks also form an inherent component of LK. Therefore, these will be elaborated in detail in the following section.

5.6 Crosscutting themes: roles of local institutions, leaders and social capital

5.6.1 *The roles of local institutions and leaders*

The data analysis indicates that across case study areas, local institutions and leaders play various roles, summarised in Table 5.4. In Malawi, in accordance with findings from the literature, local leaders and institutions were identified as important components of LK (Dekens 2007, Berkes 2009).

Table 5.4 The role of local level institutions and traditional leaders

| Local level institutions and traditional leadership | Example activities in flood risk management |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Village and area civil protection committees | <ul style="list-style-type: none"> • Committee members as interpreters of local early warning indicators • Awareness raising based on local indicators and official warning information (i.e. triangulation) • Providing advisory for villagers living in the flood plain • Negotiating land for temporary relocation • Warning dissemination • Coordination with external stakeholders (government, NGOs) • Encouragement of tree planting |
| Religious institutions | <ul style="list-style-type: none"> • Awareness raising during religious ceremonies • Churches as evacuation locations • Helping religious institution members in recovery |
| Community-based organisations | <ul style="list-style-type: none"> • Youth clubs developing theatre drama on flooding to serve as a risk communication tool • Assisting with temporary shelter construction • Assisting in afforestation initiatives |
| Traditional leaders (i.e. chiefs) | <ul style="list-style-type: none"> • Knowledge holders and communicators • Warning dissemination through organising meetings • Evacuation leaders • Facilitating stakeholder collaboration • Land provision • Providing advisory services to community members |

Local institutions include Village Civil Protection Committees (VCPCs), Area Civil Protection Committees (ACPCs), various community-based organisations (CBOs) and religious institutions. The roles VCPCs and ACPCs play in FRM have been discussed in Chapter 4, with their role here being mentioned in direct relation to LK. The members of CPCs were identified as one of the holders of LK related to flooding. Due to their position, they act as interpreters of local EW indicators.

'Because we are coming from various villages people know that we are in the disaster committee so they report to us. Also, when we ourselves observe the signs we are taught on what they mean by others so we are knowledgeable. When we see them, we interpret.' (FGD ACPC Maseya)

The role of CPCs as knowledge holders and interpreters is an interesting finding, since it yet again indicates the evolving nature of LK. In this case, it shows how an externally introduced structure (i.e. CPC) facilitated the creation of a new layer of understanding on how LK can be spread throughout a community.

Furthermore, religious institutions contribute to awareness-raising. It was mentioned how upon observing the local indicators, these might be discussed during religious ceremonies (Section 5.3.1.6). In addition, churches and religion institutions foster communal spirit and provide comfort during hardship. An interviewee from GVH Misili (CKII6) explained how in the times of floods, churches organise a day for people to get together and pray. In the aftermath of floods, churches help their members to recover faster. An interviewee from GVH Nyanga (CKII26), that lost her house during the 2015 floods, shared a story of how church helped her to rebuild her house because she was an orphan. Examples above indicate that in a country like Malawi, where religion is an important aspect of everyday life, religious institutions are deeply embedded in communities, and as such, can play a significant role in disaster-related issues. Therefore, they should be identified as important stakeholders within a community when implementing flood-related activities.

CBOs are perceived as taking part in different aspects connected to flooding. For instance, youth clubs in GVH Nyanga hold flood awareness-raising meetings, warn people to move to uplands and help with temporary shelter construction for the most vulnerable individuals; in GVH Tengani, CBOs assist in afforestation interventions. An interviewee from GVH Misisli (CKII7) explained how the youth group develops theatre

dramas, simulating what happens during flooding, and then use them as a risk communication and raising awareness tool.

Respondents identified chiefs as individuals within communities that are holders of LK. As explained by one of the traditional leaders (CKII13), he serves as a custodian of cultural practices, and he sees it as his responsibility to facilitate the process of LK dissemination within his community. In order to spread the knowledge, in some instances, chiefs will call for community meetings where LK will be talked about, as explained in Section 5.3.1.6. In GVH Tengani, an example was given of chiefs advising those farming close to the river banks to leave the buffer zones. In GVH Mbenje, chiefs advise people to plant earlier, in order not to be caught by floods whilst waiting to harvest from their farms in the lowlands later in the rainy season.

Besides being involved in warning message dissemination, chiefs also play an instrumental role in ensuring that those affected by floods have an appropriate evacuation site, by negotiating with the households located in the uplands that would be able to accommodate some of the affected individuals and families (e.g. FGD Tizola). Chiefs also reported that it is their responsibility as traditional leaders to look for an evacuation site; for instance, by asking the senior chiefs at the TA level to allocate a piece of land that could be used for evacuation (FGD M Mbenje).

In the aftermath of floods, chiefs also have multiple roles. For instance, if a household would like to build a house from burnt bricks, in order to have a more flood resilient structure, chiefs will be asked to grant permission for cutting the trees for the wood to be used for burning the bricks. Furthermore, if a family that has lost their house in the floods would want to move to the higher grounds in the community, they would approach chiefs and ask for a piece of land to be allocated.

5.6.2 The role of social networks

In times of hardship, community members rely on and seek out help from their neighbours, friends and relatives. For instance, participants explained how some community members assist each other to strengthen their houses. A female participant during FGD in Kanseche explained how community members will help the individual building the house by collecting the soil to surround and raise the house. Similarly, during the female FGD in GVH Misili, participants explained how dikes and drains at the

household level are built with the help of other community members, thus minimising the time and effort required.

During the floods, people rely on fellow community members, relatives and nearby communities in several ways. For instance, it was mentioned repeatedly how people help each other during the evacuation of individuals, livestock and property.

'You see that your friend still has more work to do, so you help them. If the oxcart carried someone's property already, it will come back to carry other people's property.' (FGD F Misili)

People also temporarily relocate and seek shelter with relatives or fellow community members that were not affected by flooding. A key informant from GVH Nyanga (CKII26) explained how, after the 2015 floods, she stayed in the nearby school. After the school was reopened for pupils, she stayed in the kitchen of a lady she met in the church, for about a month, until her house was rebuilt. If a canoe is not available within a community, it might be borrowed from a neighbouring community. After the floods, examples of community members helping each other whilst rebuilding the houses were given, as well as helping fellow individuals with food.

Even though the presented examples indicate that social networks play an important role, in some instances research participants explained that they cannot rely on fellow community members, mainly because other people within their community are affected as well and lack capacity to help themselves and the others. As narrated by a female FGD participant in GVH Kanseche: *'If I go to my neighbour who has been affected by the same floods, what would they support me with?'* This example indicates that in the case all the members of the social network are impacted by the same event, the role of the social network might diminish.

5.7 Chapter summary

This chapter revealed the diversity of LK for FRM in the Lower Shire Valley. Findings suggest that local communities have a sophisticated and complex knowledge system that assists them in dealing with flooding in their localities, indicating that people regularly experiencing flooding devise innovative ways to deal with flooding and are active players in risk reduction and management efforts at local scales.

Section 5.1 mapped different dimensions of LK, with a detailed elaboration provided in subsequent sections (Section 5.1.-5.6). This encompassed different strategies used before, during and after flooding. For instance, based on the observation of their environments, people developed a vast array of local EW indicators, used to foretell heavy rains and flooding. Furthermore, an in-depth account of peoples' perspectives showed they have detailed knowledge of flood hazards in their villages, demonstrate knowledge of flood causes, and observe changes in flooding. The richness of LK presented indicates that LK can contribute a great deal to CBFRM, especially in a data-scarce country such as Malawi. For instance, people's detailed knowledge of flood dynamics in their localities can assist in choosing an optimal location for placing flood-related infrastructure (e.g. dikes) and assist in the development of hydrodynamic models, while the complexity of local EW systems (including indicators and ways in which information is shared) can offer a great deal to official flood warning systems in the country.

In addition to the detailed account of the content of LK, which presents the most comprehensive academic study on the topic in Malawi thus far, this chapter also revealed some of the process perspectives on LK. For instance, it was shown how LK is produced through a close observation of one's surroundings (e.g. fisherman observing the river, farmers observing animal species in their farms) and experience of flooding, with new layers of understanding continuously added (e.g. evolution in the way local houses are built, adaptive strategies of owning farms both in uplands and lowlands). Furthermore, interesting insights on the sharing and dissemination of LK within the villages were provided (e.g. prevalence of informal sharing and importance of the household level). Some of the results also revealed the hybrid nature of LK by showing how people triangulate between different sources of information (e.g. between local EW indicators and official warning information, between readings from reeds placed in the river and CB-EWS).

While this chapter provided a strong empirical evidence on the richness of LK, and started to unpack some of the process perspectives, a more detailed understanding of the agency of LK within the CBFRM framework requires a further and more critical examination. Therefore, the following chapter will look into a diversity of perceptions of LK from the knowledge holders themselves, explore the factors that influence its usage and see how large scale processes (e.g. climate change, environmental degradation) and interaction with external stakeholders influence LK.

Chapter 6- Communities and local knowledge

Community-based approaches assume that people have and use LK; therefore, it is important to take it into account when designing and implementing interventions. However, empirical evidence of how people see the agency of their LK remains scarce, even though this type of information would enable a more realistic assessment of its value for DRR/FRM. Therefore, this chapter presents LK through the perspective of knowledge holders themselves. It documents what people perceive to be its benefits and limitations, and how they describe the change in LK over time (Section 6.1). Furthermore, taking into account the inevitable dynamics happening between local communities and external stakeholders (i.e. NGOs and government), Section 6.2 reveals how community members contrast and integrate different knowledges and how they see the interaction between their LK and stakeholders that are implementing CBFRM in their communities. Finally, Section 6.3 reveals different factors that shape the use of LK by community members. Through the exploration of these different themes, this chapter provides important empirical evidence needed to understand the reality of LK, and contributes to the third study objective, specifically the part on how CBFRM stakeholders (in this chapter, communities) use LK and what their attitudes are towards it, as well as revealing how LK is produced through interaction with external knowledge.

6.1 Community views on local knowledge

The Chichewa word for ‘local knowledge’ is ‘*zamakolo*’, which literally translated means ‘knowledge of parents’. Hence, it is not surprising that the majority of participants, when asked about what they understand by the term ‘local knowledge’, referred to the type of practices that they learned from their parents and grandparents, and that come from their forefathers. In addition, LK was defined as ‘*saving lives*’ (FGD F Nyanga) and as ‘*easy ways found in the villages which can help us in times of flooding*’ (FGD Tizolo), indicating its pragmatic nature.

This section will present the views people have about their own knowledge, including its benefits and limitations, as well as the perceived changes in LK. An overall reflection is that there were a diversity of views, even within the same group and among individuals coming from the same community. This indicates that LK has different agency and value for different people, and as such, should not be considered a uniform trait within a community.

6.1.1 *Benefits of local knowledge*

The answers provided by community members on the benefits of LK generally fall into three categories. Firstly, the most commonly mentioned benefit is that it fosters preparedness, suggesting that communities recognise the importance of preparedness for the upcoming event. As explained by participants, those taking note and being aware of the local EW indicators can know in advance about the possibility of a flood. As narrated by a male participant in GVH Mbenje: *‘before anything happens, you already know.’*, thus creating a window of opportunity to protect oneself and ones belongings. According to participants, earlier insight is especially useful for those living in flood-prone areas, because they can prepare by taking some of the early actions discussed in the previous chapter, thus minimising negative impacts of floods.

‘It helps us, some evacuate. Before the rivers are flooded, we evacuate our children and property across the river to Misiri. If you have a relative there, they give you a place to stay. If you do not have a relative, the men will get trees and build a temporary shelter from grass, you will be cooking outside so far as the children and property are safe. When the water recedes, you return to your home.’ (FGD F Kanseche)

People emphasised that having early insight raises overall awareness in the community, an important benefit in a context such as Malawi, where the official warning system is outdated and the uptake of official warning information is low. As explained by CKII13 from GVH Mbenje, when aware of the indicators, as community members go about their regular work they know that there might be flooding at anytime. Similar was stated during the FGD with men in GVH Mbenje:

‘The benefit is that what you believe helps you in that time. It helps because everyone knows that this year there will be floods so all those who want to evacuate can do so early.’

Furthermore, across different case studies, participants expressed that not taking early action has negative consequences. It was emphasised that those taking into account local EW indicators and acting upon them experience fewer losses compared to those that do not.

‘They lose a lot of things. Those who evacuated earlier move easily with their belongings and children. Those who stay behind lose a lot. If you are saving children, you can’t go for livestock or property. They all go with the water.’ (FGD F Kanseche)

As a second important benefit, people emphasised that LK is generally accessible and affordable. They have seen strength in the fact that it does not require education or

external support from NGOs and government. It was further explained that unlike interventions that come to communities from the outside (including CBFMR), using LK does not require a level of literacy, thus making it easier to comprehend for the illiterate community members. Moreover, not surprisingly, taking into account high poverty in the region, people often saw a benefit through portraying LK as affordable. It is often readily available for low cost or no cost (e.g. dikes surrounding the houses are made out of local materials, mud used to strengthen the foundations). This point was especially emphasised in relation to early warning, with an interesting example provided by the key informant (CKII10) in GVH Mbenje:

'He says that local knowledge is important because it does not require a lot and it does not cost much to them. Like for alerting people that you have been affected by floods, you just beat the metal bucket. It will not cost you anything, whereas, for you or community to own a megaphone, it will be more expensive than the local knowledge.' (research assistant translation during CKII10 in GVH Mmodzi)

Although affordability was seen as a benefit, it is important to emphasise that in several instances, some community members pointed out that they use LK only because there is a lack of access to any other options.

'We do this because we have no other choice. Mostly our beliefs, we believe and use them because we see that we do not have the other resources to give us information.' (ACPC Maseya)

As a third category of benefits emerged through the analysis of transcripts, there was a strong sentiment of LK being a part of the local culture. As narrated by female FGD participants in GVH Mbenje: *'Local knowledge is our culture so when new things come in, it is hard to leave it.'* This indicates that local people assign cultural importance to LK and suggests the importance of considering the cultural context in DRR, a topic receiving increasing importance in disaster literature (e.g. Mercer et al., 2012; Krüger et al., 2015). An emphasis given to the cultural component of LK is also evident in the following quote:

'Following our Sena words, that he who has a home owns things. So for us, this is our local knowledge. It helps us a lot and we rely on them, unlike things that are brought by outsiders. The same with where you are coming from, you have your own beliefs.' (FGD M Tengani)

The previous two quotations suggest an interesting aspect: by seeing LK through a cultural lens, people might be sceptical towards external interventions that do not account for cultural customs, emphasising the importance of context-sensitive solutions in CBFMR. However, knowledge holders consulted in this study were not uncritical about

their knowledge, as they identified a number of limitations presented in the following section.

6.1.2 Limitations of local knowledge

6.1.2.1 Limited effectiveness

The limited effectiveness of LK emerged as the most common limitation, which can be partly explained in that the case study communities have been affected by unprecedented floods in 2015. The fact that people critically assess their LK based on its effectiveness suggests that people assess their knowledge in a rational manner and are aware of its limits.

A lot of discussions regarding local methods were in relation to their effectiveness for annual and extreme flooding. Participants explained that some of the methods are not effective during extreme floods. For example, dikes constructed from local materials collapse during the floods of higher magnitude, reeds used for measuring the water heights are carried away, canoes are difficult to operate. These results confirm the findings from the literature (e.g. Mavhura et al. 2013) and suggest that the applicability of LK is limited to what people already know and have experience with. In GVH Mbenje and GVH Nyanga, communities reported that in 2015, raised platforms (i.e. '*chete*'), commonly used as a temporary accommodation option during floods, failed. Participants described that these were simply not strong enough to withstand a flood of that magnitude. These results indicate that the use of LK and views of its effectiveness can be negatively influenced by extreme events that might render some LK not applicable.

Furthermore, other interesting insights were shared in relation to LK and extreme events. First, it was mentioned in GVH Misili, GVH Tengani, and GVH Nyang'a, that local EW indicators were forgotten due to the absence of extreme floods in these communities for a long period of time. However, as participants explained, the floods of 2015 prompted them to pay more attention to indicators. This shows that extreme events can serve as a trigger for raised awareness and increased usage of LK, since people can become less observant of their LK in the absence of flood events. Secondly, while some of the dimensions of LK might be used less due to the effects of extreme floods, the results of this research indicate that some other LK becomes more prominent instead. The most interesting example comes from GVH Mbenje, where participants coming from Kadyamba village shared their experience. These villages were relying on '*chete*' to keep

them safe during the floods. However, after 2015, when these structures collapsed and people lost their lives, a large proportion of the community decided to permanently move to the uplands, only returning to the lowlands to farm, where they will construct temporary shelters (*'makumbi'*). Yet again, this example indicates the dynamic and evolving nature of LK, and suggests that local communities are active learners, which continuously 'update' their LK upon confrontation with an unprecedented event. Therefore, while some LK becomes obsolete, new knowledge is created.

In addition to discussing the limitations of LK in the light of extreme events, participants also shared several other examples of the limited effectiveness of LK. For instance, it was discussed that local canoes, previously identified as the most common evacuation means, depend on human strength, might flip over due to overcrowding and are susceptible to attacks from crocodiles and hippos. Furthermore, some explained how locally available warning dissemination methods (i.e. drums) are limited in their reach (i.e. not everyone can hear it).

6.1.2.2 Reliability

Another commonly identified limitation of LK was the reliability of local EW indicators, as exemplified in the following quote:

'What our parents told us is not there. If they told us that when you see this, rains are coming, it would happen whereas now we might see a lot of ants but there would be no rains.' (FGD F Mmodzi)

The reliability was commonly discussed in a relation to a timeframe (i.e. comparing 'how it was' as opposed to 'how it is now'). In addition to ecological indicators, people expressed that meteorological indicators are not that reliable, whereas riverine indicators were seen as reliable - which can be explained by the fact that riverine indicators are observed very close to the actual flood event and are based on the observation of the river that floods, as explained in Chapter 5. Often, research participants clearly recalled examples of events where local signs were not reliable (e.g. 2001, 2005, 2016). For instance, a participant during the FGD with ACPC Maseya shared: *'Like last year [...] hippo moved from the marshes into GVH Mlolo area but there were no floods.'*

Results indicate that local indicators carry a level of uncertainty, with participants stating that sometimes they might observe the indicators, but they do not correctly foretell heavy rains or floods. This draws a line of similarity with official flood forecasting systems,

where uncertainty also presents a challenge (Demeritt et al. 2007) and influences warning information uptake.

The results suggest that perceptions of reliability influence people's decision to take early action. For instance, in GVH Nyang'a, female participants explained that some people decide not to evacuate early based on the local indicators because in previous instances they might have evacuated and nothing had happened.

Although the reliability of LK was primarily mentioned as a limitation, it is important to emphasise that there were participants (primarily elderly) who identified the reliability of LK as a benefit. This discrepancy demonstrates the heterogeneity in people's engagement and use of LK, as will be discussed in more detail later on in this chapter (Section 6.3).

6.1.2.3 Informality

To a lesser extent compared to previously described limitations, the informality of LK was perceived as a limitation primarily in terms of this knowledge not being documented and the informal nature of its sharing. The fact that LK is not documented was expressed as a worry since participants felt that once when those that are perceived to be the main holders of this knowledge (i.e. elderly community members) pass away, the knowledge might be forever lost.

*'We don't document them [the signs], we just keep them in our heads.
While the written things are lasting.'* (Mbenje M FGD)

Furthermore, as explained in Chapter 5, LK is predominantly shared in an informal manner. This was seen by some community members as a limitation in relation to early warning, because there is no standardised system for sharing the warning messages meaning that there is a possibility that not everyone will be aware of the threat.

While this limitation, together with two other perceived limitations identified by research participants can be seen as a limitation of LK in itself, participants also discussed another aspect influenced by factors beyond LK in itself and discussed in the following section.

6.1.2.4 Lack of action

In Chapter 5, a detailed account of various early action strategies that people employ based on observing local EW indicators and triangulating them with the official warning information was provided. However, participants shared that some individuals within the

community decide not to take any action, despite being aware of the local indicators. Therefore, the lack of adherence to local early warnings indicators was perceived as a drawback, since it causes individuals more damage and losses.

'Some will adhere while others will not. A lot will hear the message but very few will adhere to it. They hear it but not make use of it.'
(Tengani M FGD)

What this example suggests is that being aware of an upcoming threat does not necessarily lead to taking action. There were several reasons identified for why people fail to take early action. First, it was due to the information's uncertainty. Despite observing the signs and receiving some form of official warning communication, some will prefer to stay in the flood-prone areas over early evacuation and temporary relocation. As mentioned in the FGD with male participants in GVH Nyang'a, *'people want to see with their own eyes that they are being affected'* and that individuals *'can't follow the local signs until they see that the water has reached their houses'*. This can be also attributed to the previously mentioned reliability of local EW indicators and indicates that people prefer to have a more definitive indication of floods. Second, some participants explained that those residing in flood-prone areas decide not to take any action due to their general attitudes. For instance, during FGD with male participants in GVH Mbenje, a participant shared that *'it's too much work to move their property to the uplands in the case floods will not come'* (FGD M Mbenje). Furthermore, some lack awareness of the benefits of early evacuation and temporary relocation (ACPC Tengani), and some have the attitude that one will have enough time to safely evacuate when floods arrive (CKII15). Third, people opt not to take any early action in order to sustain their livelihoods. For instance, farmers cultivating in the flood-prone areas might be reluctant to leave their farms unattended:

'Sometimes it might happen that water recedes much later in the farms so people will plant late and water may find you there. Because you don't want to leave your maize crop behind, you wait for it and floods find you there.' (FGD M Mbenje)

Similar was explained for those community members whose main livelihood is fishing. Inability to conduct fishing in the uplands impedes their decision to temporarily relocate.

'Some people are used to eat[ing] fish, because it is cheaper, they are able to catch it themselves, so they think what life will be like in the upper parts, because when they come here, they are supposed to buy everything, and there it is for free. So with that knowledge people choose to stay there.' (research assistant translation during CKII15)

What these examples suggest is that a setting in which people are predominantly oriented to and dependent on a single source of livelihood, with limited options to generate a living otherwise, results in a lack of early action.

Finally, during the analysis, it emerged that some feel a strong sense of attachment to their localities, including land often referred to as ancestral. Hence, leaving their homes is not seen as a viable option. As pointed out by an elderly woman in GVH Kanseche: *‘Home is home, we have lived here for so long.’*

These findings on why people decide not to take early action point to the complexity of the factors that play a role when making a decision to temporarily leave their homes and farms, or sources of livelihood. Therefore, people should not be described as simply reluctant to leave, but rather seen through a lens where their decision is a subject to a complex web of different factors.

In addition to the benefits and limitations discussed thus far, another theme that emerged during the discussion of communities views on LK is perceptions of its changes over time, described in the following section.

6.1.3 Changes to local knowledge

Community members perceived a significant change in the use and importance of LK compared to the past and identified a number of reasons, summarised in four main categories presented in Table 6.1. The results indicate that LK nowadays bears less importance and significance compared to the past, resulting in decreasing reliance on LK.

Table 6.1 Summary of changes to local knowledge

| Perceived change | How it influences LK? |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental degradation | Environmental degradation results in the extinction of some of the flora and fauna used for local forecasting and it changes the nature of flooding. |
| Penetration of new approaches and technologies | Due to new approaches and technologies, people are abandoning their LK |
| Population growth | Increased population leads to increased environmental degradation and scarcity of land |
| Climate change | Due to climate change and associated impacts, LK is less reliable |

6.1.3.1 Environmental degradation

Environmental degradation emerged as one of the main causes of the changing nature of LK and was evident in several aspects. For instance, some of the flora and fauna species used as EW indicators were reported as not available anymore.

‘... some of the things they relied on like animals or birds are becoming extinct. Little by little, what they use is becoming far from them so they are unable to tell the actual thing concerning the season.’ (FGD ACPC Maseya)

Furthermore, due to increased cutting down of the trees, practices such as raised platforms for people and food storage are not of sufficient quality since the strong trees used as a construction material cannot be easily found. As outlined in Chapter 5, environmental degradation is influencing the very nature of flooding, and participants explained that the usefulness of LK has decreased because the magnitude and impacts of flooding are greater. These results suggest that environmental degradation is directly influencing the availability of LK, and consequently, peoples’ access to LK. Furthermore, it also affects the effectiveness of LK. Taking into account that environmental degradation presents a serious issue in Malawi, a question arises of the extent to which this will continue to influence LK.

6.1.3.2 Penetration of new approaches and technologies

Another major process influencing the perceived change in LK was the penetration of new approaches and technologies brought by NGOs and government departments, through approaches such as CBFRM. Results suggest that the increased access and exposure to technologies and new approaches (e.g. official warning systems) inevitably influence how people use and perceive LK. As voiced out by a key informant CKII29 from GVH Nyang’a: *‘the introduction of scientific ones reduce the use of local knowledge’*. For instance, across case study villages, participants were explaining that official warnings and weather forecasts received through different channels (e.g. radios, VCPCs, NGOs and government) are changing the way LK is used within communities.

‘We are slowly abandoning local knowledge because the weather forecast tells us that there will be rains this time and it happens.’ (FGD M Nyanga)

In some instances, participants even argued that due to this penetration, LK is disappearing- indicating the extent of this influence. For instance, during a female FGD in GVH Mmodzi, a participant stated: *‘Now NGOs are all over bringing new things so the local knowledge is disappearing.’*, whereas a female participant during an FGD in

Mbenje stated that *‘whenever new thing comes, people are following that and abandoning local knowledge.’*

According to some participants, LK was more important and useful in the past because that was the only option for communities, whereas now they are exposed to different approaches:

‘In the past, we relied on local knowledge a lot because there was no technology. We thought they were very important but now it is not reliable because the better methods have come.’ (FGD M Mbenje)

In a setting such as the Lower Shire Valley, where floods are a consistent problem and the concentration of stakeholders working on finding a solution to this problem is high (including CBFRM), it is inevitable that LK is influenced by new approaches and technologies, as the results suggest. However, it is also important to remember that findings from Chapter 5 suggest that people are constantly involved in a process of triangulation between different sources of information (in relation to EW). Therefore, it can be inferred that LK is not necessarily disappearing, but is rather exhibiting one of its main characteristics: dynamisms and evolution through an interface with new knowledge, which will be further explored in Section 6.2.

6.1.3.3 Population growth

Mentioned to a lesser extent than the above, increase in population also influences LK availability and use in several aspects. For instance, it was shared that increased population caused higher environmental degradation, thus leading to implications already identified in Section 6.1.3.1. Furthermore, an increased number of people can also affect decreased effectiveness of LK. For instance, as stated by the key informant CKII19, nowadays, the number of canoes is not enough to cater for an increased number of people, leading to canoes overcrowding during flooding. Moreover, the increased population also leads to increased pressure on the available land. As explained by CKII10, the strategy in which people own houses both in the uplands and lowlands is becoming rare, due to the scarcity of the available land.

6.1.3.4 Climate change

As pointed out in Chapter 5, participants shared that climate change is predominantly observed through changes in rainfall patterns. In relation to LK, some participants mentioned that these changes led to decreasing reliability of local EW indicators. The

perceived unpredictability of rainfall manifests in a sense of not being able to relate the indicators with what is happening on the ground. For instance, during the female FGD in GVH Mmodzi, some participants stated that there is simply no difference between the rainy season and the rest of the year, and the signs will be observed anyhow, without being translated to actual events. The influence of climate change on perceptions of LK is presented in the following example:

'... In the past [...] rainfall normally started in October, that is when they would plant their fields and rains would start then. But now, things have changed, rains start coming around December, January [...] so it is hard to believe things. If you see things and say it will rain when it is not happening, whereas when the old people would see the signs and say it will rain, it would happen almost right away compared to now. So it is hard for people to follow and believe the signs.' (research assistant translation during CKII11)

What this examples suggests is that due to climate change, knowledge holders are losing trust in their local indicators. Indeed, loss and damage component of the global climate change negotiations (UNFCCC 2015) points out that LK systems might be affected by climate change beyond the point of adaptation.

During data collection, discussions on LK necessarily involved discussions of the knowledge coming to communities through interventions implemented by NGOs and government. Therefore, these aspects are covered in the following section.

6.2 Community views on external knowledge

Throughout data collection, research participants referred to *'modern'*, *'scientific'*, *'exotic'* and *'external'* knowledge to refer to knowledge that is introduced to communities through projects and initiatives by NGOs and government (e.g. CBFRM projects, official warning information). For the purposes of this chapter, the term *external* is adopted to refer to knowledge that is either or both professional (e.g. practical advice on building a dike) or scientific (e.g. using weather forecasts). As presented in Chapter 4, communities in the Lower Shire Valley are exposed to a number of CBFRM interventions, and consequently, to external knowledge. In such a context, a lot of discussions on LK revealed its contrast and interaction with external knowledge. Similarly, it involved community reflections on how external stakeholders engage with LK.

6.2.1 Contrasting local and external knowledge

A first interesting aspect regarding community views of external knowledge is that, during data collection, participants were continuously contrasting their LK with the

knowledge they are exposed to from the outside. Several dimensions of the contrast emerged.

6.2.1.1 Early warning: timing, spatial context and reliability

In terms of timing, there were generally two aspects discussed. Firstly, research participants stated that the official warning information (i.e. external knowledge) has an advantage since it provides, in their view, a more accurate timing of the event, whereas LK largely does not incorporate this information (except the riverine indicators). Secondly, participants explained that LK is observed in advance of the official information (e.g. as presented in Chapter 5, some indicators are noticed already in June/July; whereas, for instance, seasonal forecasts are released in Malawi usually in late September). This suggests that LK and external knowledge exhibit their ‘strengths’ in different aspects, and as such, they can complement each other.

Another benefit of LK over external knowledge was in terms of spatial context. Empirical data show that official warnings lack the spatial resolution required by communities because these are released on a district scale; whereas LK indicators were described as being applicable for the immediate spatial location (i.e. villages).

‘Sometimes they might hear that in Chikwawa there will be a lot of rainfall, but that is just general for Chikwawa. Whereas those signs are localised, like for their community. They will see the signs and know that this will happen in our community, not just the general knowledge.’
(research assistant translation during CKII7)

An interesting aspect emerged in GVH Kanseche where participants explained that official information is especially useful to receive warnings for flooding that originates due to rainfall in the upper parts of the catchments.

‘Modern ways are also beneficial because in 2006 there were floods but there was no water here it originated from the uplands. Rains fell in the uplands not here so the modern ways are also important.’
(FGD M Kanseche)

Furthermore, the concept of reliability was further discussed. There was no consensus between research participants and between case study communities, with examples of both local and official warning information providing inaccurate information given. For instance, with regards to LK, male participants in Nyang’a argued that LK is ‘*not as reliable as scientific knowledge*’. On the other hand, it was mentioned several times how

in 2016 official information was indicating floods when in fact the region was hit with a severe dry spell in the end.

'Like last year they told us to move because there would be floods but it did not happen. Whereas for the local knowledge there were no hippos or any other signs so we were surprised that they were announcing when we didn't see any signs so we didn't believe it.' (FGD ACPC Tengani)

Therefore, it is clear that both local and the official EW have 'failed' the communities previously, resulting in often noted mistrust towards the warning information, regardless of it being of the local character or coming to communities through official warnings. The demonstration of both benefits and limitations of both official and local EW systems, indicates a need for an approach where LK would be integrated into the official warning system, which will be discussed in more detail in Chapter 8.

6.2.1.2 Access

External knowledge comes at a cost. Therefore, taking into account the poverty levels, it is not equally accessible to everyone. For instance, participants pointed out that the official warning information is communicated often via radios and mobile phones (i.e. some are receiving text messages), which not everyone can afford. Similarly, megaphones for disseminating the warning message are more expensive than drums made out of local materials. Moreover, in GVH Mmodzi, an example was shared of an NGO building a more robust storage facility, but that this included the use of iron, which is a material not affordable for the communities.

'They [external knowledge] are better only that the modern ways have just begun and they require money which most of us don't have.' (FGD ACPC Maseya)

'The modern ways are better but we still use the local knowledge because we lack resources to use modern technology.' (FGD M Misili)

These quotations exemplify a sentiment very often expressed during the data collection: although people would prefer to use more technology and improved methods, they are not able to afford it. Therefore, they stick to what they can access- again indicating that people often use LK not because they prefer it and are 'ignorant' towards external solutions, but rather because their living conditions do not allow them to diversify their approaches.

However, data analysis pointed out another very important aspect. Not only that people have difficulties accessing external knowledge, but results suggest that not everyone has the same capacity to access LK, although LK was seen as more affordable (Section 6.1.1). People in the Lower Shire Valley are generally poor, and there are substantial differences within a community, with some community members being better off than the others are. Various examples were shared how a lack of access to resources (e.g. financial resources, land) hinders the use of many LK dimensions described in Chapter 5.

For instance, people shared that although they understand the importance of storing food in advance, they might not have enough yield to do so.

'It depends on how much you have. Those who harvested a lot may store, while those who didn't harvest will not store anything.' (FGD F Misili)

Similarly, it was mentioned many times that building more flood resilient houses (e.g. incorporating plastic in the roof, raising the foundation, changing the method of construction) is costly, and hence, not equally available to everyone. In the words of a male FGD participant in GVH Mmodzi:

'You might change the method of construction if you have money. If not, you just build with mud bricks.'

Furthermore, local adaptation practice of owning two houses (in the uplands and in the lowlands) or renting farming plots both in the uplands and lowlands are not easy to implement in a context where people are poor.

'It is expensive to buy land from someone. Can someone like me afford to buy land? Where will I find the money? I am failing to feed the orphans at home, where will I get the money?' (FGD F Nyang'a)

It was also shared that not everyone has an opportunity to afford the means to evacuate during a flood. In some instances, participants explained that the canoe owners expect them to pay for evacuation- indicating that reliance on social networks (Section 5.6.2) is not always possible.

'The canoes, mostly the priority are the owners of canoes, so they would start by saving their lives and their property before they come back for anyone else. And mostly when they are done, they might require for people to pay them to be helped. [...].' (research assistant translation during CKII6)

These examples caution against a portrayal of LK as being easily available to community members before actually analysing what aspect of LK is available to whom. They also

suggest that although people are aware of LK, at times they are constrained in accessing it.

6.2.1.3 Impact

Another dimension of contrast was on the perceived impacts of applying LK or external knowledge. According to the data, external knowledge was perceived as more impactful. Different narratives were shared. For instance, more lives saved due to official warnings, warnings easier to disseminate with megaphones, safer evacuation in engine boats.

'The modern ones are saving more lives. We suffered too much loss and lost children when we used the local ways. But we see the modern ways are helping.' (FGD F Kanseche)

The research identified an interesting aspect related to the training provided to VCPCs. Once trained, the members of the VCPC are supposed to conduct awareness-raising meetings in their villages. Although, as described in Chapter 4, VCPCs were criticised for failing to engage the community at large, research participants who attended the meetings organised by VCPCs reported that these are helpful because the messages and new knowledge reach more people. Furthermore, it was reported that uptake of warning messages is higher due to these meetings and that VCPCs practically demonstrate how some flood protection measures can be implemented (e.g. building dikes) whereas LK is a *'word of mouth'* (CKII6).

The benefits of training were also elaborated in GVH Tizolo, where research participants explained that the introduction of community-based early warning systems and associated training of VCPCs to monitor the gauges brings more *'structure'* into the current system; and hence, upon observing the rainfall, committee members will monitor the gauges and associated danger levels (i.e. green, yellow and red). These former examples provide valuable insight. They indicate how *'institutionalisation'* brought by government and NGOs by establishing the VCPCs creates a certain situation in which certain community practices are *'formalised'*.

However, it was mentioned that external interventions, such as training, have a *'flaw'*, because they are temporary, whereas LK is constant.

'Local knowledge is very important because like we have said that are things that are constant while the trainings that we get from NGOs,

they train us only for a short time. For example, they gave us phones which are no longer working'. (FGD M Kanseche)

This relates with the overall problem of sustainability identified as one of the major obstacles of the current CBFRM in the Lower Shire (Chapter 4) and suggests that while people in the communities might get exposure to external interventions and knowledge, it is at times challenging to sustain them in the long term.

6.2.1.4 Familiarity

Research participants stated that the advantage of LK over external knowledge is that they are accustomed to it. External knowledge is perceived as new whereas LK is familiar; people are used to it and is a part of the culture, so it is '*hard to leave it*' (GVH Mbenje). Interestingly, in GVH Mmodzi, a male FGD participant explained that things introduced to communities by outsiders are accepted only after community members see them functioning in practice.

'When they train us we use both ways in case one will not work. When we see the benefits of modern ways we continue with it.' (FGD M Mmodzi)

This example suggests that people get involved in a process where they first experiment and test, before proceeding to use what is more appropriate for them, and depicts how knowledge is produced. It clearly indicates that local people are active learners continuously involved in new knowledge production and reproduction of the knowledge they already have.

Furthermore, those who preferred LK emphasised the importance of the knowledge being 'visible'; people often referred to the benefit of being able to see the signs in their own villages.

'We just hear with our ears when they are announcing but we have never seen anything grow in the ground that's modern to know it is a sign of water'. (FGD F Mbenje)

'It [local knowledge] is more practical and visible. When you see the ants, hippos, and lumbus then you are sure that this year we'll experience flooding. Unlike those ones they are just scientific without proof.' (FGD F Tengani)

These examples illustrate that the power of LK lies in its' visibility and easy comprehension for local people, as presented in Section 6.1.1. On the other hand, when

it comes to the official warnings, people are not aware where these originate from nor how they are created, and they are therefore sometimes perceived as ‘distant’.

6.2.1.5 Documentation

Connected to the identified limitations of LK (Section 6.1.2.3), in ACPC Maseya and GVH Mbenje participants contrasted LK and external knowledge by focusing on the fact that LK is not written down and is ‘*stored in brains*’ (GVH Mbenje), whereas external knowledge is documented and as such, more formal, lasting and easier to access. As narrated by an ACPC member in TA Maseya:

‘Before writings, people believed in the mouth to mouth transfer of knowledge, but when things were written it stays longer. But once when these people die, nothing is written, the young generation is coming up with a different culture.’

This suggests that knowledge holders see value in documenting LK, thus making it more accessible, especially in light of a fact that many times community members expressed a concern that the LK might be slowly disappearing with the elderly, while younger generations exhibit less appreciation for LK.

6.2.2 Integration of local and external knowledge

Despite the described contrasts between LK and external knowledge in section 6.2.1, research participants expressed that they use both local and external knowledge, as evident from the following quotations:

‘NGOs come and gives us weather forecasts so we take what they tell us and what we hear and use them both during the community meetings.’ (ACPC Tengani)

‘We just combine both local and modern ways. If we are with the elderly, we get what they are saying and just combine.’ (GVH Mbenje F)

In the context of this thesis, the term *integration* represents the process of combining what research participants described as LK used for FRM with information and approaches coming to communities through external stakeholders and mass-communication media (e.g. radios). Table 6.2 presents different examples of integration documented in this study.

Table 6.2 Examples of different dimensions of integration between local and external knowledge

| DIMENSIONS OF INTEGRATION | INTEGRATION EXAMPLES |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water level monitoring | <ul style="list-style-type: none"> - Upon getting information about the water levels observed at the stage gauge (as a part of the CB-EWS), people place the reeds in their localities and monitor the water levels - People easily got accustomed to the stage gauge because it was based on similar principles as their readings of the reeds - Upon observing the stage gauge, chiefs might assign people to spread the message across the village - Upon observing the local indicators (e.g. ants) community members will closely observe the stage gauge |
| Dissemination and communication | <ul style="list-style-type: none"> - Existing dissemination and communication means are improved by VCPC organising community meetings (i.e. outreach to a larger number of people), using megaphones, whistles, and phones provided by NGOs - Upon receiving a phone call from upstream communities of the possibility of an upcoming flood, people will beat drums - supplementing drums with megaphones |
| Action planning at the community level | <ul style="list-style-type: none"> - In the Village Contingency Plans, VCPCs include both local knowledge and the official forecasts provided by the meteorological department - During community meetings, both local signs and seasonal forecasts are shared - Communities asked to identify safe places for building an evacuation platform |
| The decision to take action (e.g. evacuate people, livestock or property) | <ul style="list-style-type: none"> - Decision based on triangulation between local signs and official information received through various sources (e.g. radios, NGOs, government. VCPC, and ACPC announcements) |
| Preparedness | <ul style="list-style-type: none"> - Individuals taking into account information both from seasonal forecasts, official warnings, CB-EWS and from local indicators (i.e. triangulation) -Constructing temporary shelters in the uplands and relocating uplands upon the triangulation -Upon hearing the seasonal forecast, people will be on the 'lookout' and closely observe the river behaviour to decide when to move - Awareness-raising meetings tailored to individuals living in the flood-prone areas organised based on a combination of local and official information |
| Risk mitigation | <ul style="list-style-type: none"> -People build small-scale dikes of local materials, plant trees, reeds, leave buffer zones. These initiatives were already traditionally implemented by communities, and are just further encouraged through VCPCs, who understood their importance through training. |

The integration aspect presented in this section is yet another proof of the dynamic nature of LK and its production. As apparent from Table 6.2., the integration takes place across various activities. People have incorporated the knowledge they received from the 'outside' and found creative ways to integrate it into their own approaches. The integration takes place in an informal manner, starting from the individual level (e.g. triangulating between observations and the official warning) all the way to the community level (e.g. including LK indicators in the contingency plans). This indicates the extent to

which CBFRM and interventions implemented through it (Chapter 4) have opened the ‘doors’ for integration. Through integration, communities become ‘*more knowledgeable*’ (FGD M Nyang’a), and people understood the benefits of using different knowledge types.

‘They [trainings] helped because they gave us more insight. We could do some things but they added more knowledge so it helped us.’ (FGD F Misili)

Throughout different communities, FGD participants and interviewees stated that local signs are triangulated with official information (e.g. seasonal forecasts) to assess what is to be expected in the upcoming season, and vice versa. This triangulation is done by individuals, but also during the meetings conducted by VCPCs. In many instances, participants explained that megaphones, whistles, and phones were integrated into the already existing informal warning dissemination channels (e.g. beating of drums or metal buckets).

It is important to emphasise the role of VCPCs and ACPCs in the integration process. In principle, the members of these committees are mediators between external stakeholders and the wider community. As explained in Chapter 4, they go through training by NGOs and government where they are exposed to new methods. The training is seen as useful by research participants since it creates an opportunity to refine LK and integrate external perspectives. The roles of CPCs at local levels indicate that they are uniquely positioned to facilitate the integration process, by communicating information between community members and external stakeholders. The results suggest that members of the CPCs, since they are exposed to training, are in a better position to get involved in the integration between different sources of knowledge, ultimately using what is seen to work best in light of external pressure, such as a flood. Those who have not received any training rely more on LK, whereas individuals who did (like CPCs) ‘*might have more knowledge*’ (research assistant translation during CKII6).

6.2.3 Perceptions of external stakeholders attitudes to local knowledge

During data collection, participants were asked to express their views on whether external stakeholders (i.e. government and NGOs) value and take into account their LK, as it was assumed that this type of information might result in useful insights on the dynamics between LK and CBFRM. Depending on a case study community and/or an individual interviewed, both negative and positive examples were given. This was conditioned by

communities' and individuals' previous experience of working with external stakeholders.

Instances in which research participants expressed that they believe that external stakeholders take into account and value their LK were primarily related to examples where external interventions resembled already well-established approaches within the communities- indicating the value of incorporating LK, as it promotes interventions that communities are already accustomed to. For instance, planting trees and vegetation as a flood management measure, planning an evacuation platform on a location recommended by villagers, asking for advice regarding the water flow dynamics in the villages. Furthermore, positive views were reported when research participants recalled examples of NGOs and the government facilitating the implementation of projects that were prioritised by community members themselves (e.g. government financing river dredging or stabilisation of river banks). Moreover, in several instances, research participants pointed out that external stakeholders might encourage them to use their LK while educating them and introducing new methods. In these cases, it was explained that communities will be advised to use both (i.e. external and local): *'They tell us that we should not abandon the local knowledge but we should also use the scientific knowledge.'* (ACPC Tengani). The CKII3 from GVH Misili further explained:

'If they [NGOs] give them new ways, they will say it is up to you, you can compare what we are giving you and what you are already using to see which one is more important.' (research assistant translation during CKII3)

Some participants mentioned that NGOs working in their communities might ask about the LK and take note of it. However, as pointed out in GVH Tengani:

'They ask us of our local knowledge. They leave us with their modern knowledge and take our knowledge. When they come, we tell them what we believe and they write it but we don't know what they do with it.' (FGD F Tengani)

The former example indicates the lack of feedback to communities from the side of NGOs, and an extractive, rather than participatory and community-owned CBFRM process, connecting with the raised concerns of the current participatory practices and accountability presented in Chapter 4.

Previous examples describe a situation in which research participants expressed that external stakeholders take into account and value LK to a certain degree. However, there

were more discussions depicting scenarios in which this is not a case, indicating the overall lack of satisfaction of the extent to which external stakeholders incorporate LK. Firstly, across different communities, it became apparent that local people feel that external stakeholders view LK as backwards.

'We may have the vision to say that this year we will have such problems so we ask the government to help us... Because it comes from such signs, they will say, when we have the money we will give you, but don't trust the local knowledge, they are for the past.' (FGD GVH Tizola)

What is interesting is that the results suggest that a lack of respect for LK from external stakeholders influences how communities perceive their own capacity to deal with floods. For instance, in GVH Kanseche, a male FGD participant explained:

'When they come they listen but they tell us that those are old ways, follow these ones, they will help you. That is what they teach us, and we are people who are being taught so we can't have more wisdom than them that we cling to our local ways. We may not learn.'

As evident from this example, a lack of appreciation towards LK of people that work with local communities might undermine communities' confidence in their LK.

Furthermore, some community members pointed out that not taking communities' inputs and LK into account can result in the implementation of projects that are not fit-for-purpose nor sustainable. An interesting example was shared during the FGD with ACPC in TA Tengani, Nsanje:

'For example when they wanted to build a dyke on Namiyala River, when I got there I told them that what they were doing would cause flooding to the agriculture project, the market, the hospital and across the river because you are blocking the water. There is no clear course for the water so if you have failed to construct a bridge, just build a drift. But they did not listen. When they had done what they wanted the whole area was flooded, even to the hospital and across the river. So we tell them that for every project they should consult the community, but they still did not listen.'

This example offers a useful insight into how not taking LK into account when developing infrastructural works can lead to inadequate solutions and even an increase in flood exposure and vulnerability. As evidenced in Chapter 5, Section 5.2, people have a rich knowledge of flood behaviour in their localities; hence, it is important to consider it in CBFMR.

When asked whether LK is valued and taken into account by the external stakeholders, research participants often explained that they feel it is not and this was explained by emphasising that external partners come to communities and introduce ‘new things’.

‘It is hard to tell if they respect it or not because these days most things are modern. So, they do not respect it, they teach us modern ways.’
(FGD M Kanseche)

People shared what they perceive to be reasons for this general under-appreciation and under-utilisation of LK. First, they mentioned that it is difficult for external stakeholders to understand LK and acknowledge its value since this knowledge is ‘distant’ for them (i.e. as described by participants, they do not have a chance to see it manifesting on the ground). Second, participants believe that not placing value and including LK is influenced by the fact that external stakeholders see that although local people possess rich LK, they are still being affected by flooding. Third, participants elaborated that NGOs and government simply feel a preference for technological solutions.

6.3 Factors influencing the community use of local knowledge

While engaging with the data on communities’ views on local and external knowledge, it became apparent that people’s use of LK is dependent on several factors. Thus far, it was demonstrated that access to resources determines what parts of the LK repository people can access (Section 6.2.1.2). Furthermore, it was shown that exposure to external knowledge and training (brought through CBFRM) also influences the use of LK (Sections 6.1.3.2 and 6.2.2). However, additional factors were discovered and are explained in this section. Identification and consideration of these factors is important in relation to CBFRM and its engagement with LK, as these additionally suggest that LK is heterogeneous within a community. It aids a comprehensive understanding of the reality of LK, since it reveals its complexity, and emphasises that a mere consideration of different dimensions of LK (presented in Chapter 5) is not sufficient.

6.3.1 Age

Very often, there was a strong sentiment among research participants that the younger generations are not using LK, and due to modernisation and exposure to external knowledge, place less value to it. Some participants thought that younger generations often see LK as backward and a matter of the past. It was discussed how the process of intergenerational knowledge transmission is challenged by the fact that younger generations cannot relate the signs shared by their parents with what is happening on the ground. As explained by a younger male FGD participant in GVH Kanseche, for him it

is difficult to use LK since he is only being told about it, without seeing its practical manifestation. This greatly contributed to the perceived decreasing reliability of LK, explained in Section 6.1.2.4.

'He tells his children, to say this is what used to happen when you see these signs. So he says that for him, when his parents taught him, he was able to experience some of those things, but right now, much as he would tell his children that when you see these, there will be a lot of water, the kids are not able to relate what he told them with what is happening on the ground. So it is hard for them to believe what he is saying.' (Research assistant translation during CKIII1 in GVH Mmodzi)

On the other hand, older community members, identified as main holders of LK, are accustomed to LK and have a long-standing experience with it. Through their long experience with flooding, they have time-tested the knowledge:

'As someone older, I prefer local knowledge because I have grown with it and I use it. I don't like modern ways.' (FGD M Mbenje)

This example suggests another interesting aspect: due to their familiarity with LK, elderly people might be reluctant to use external knowledge. This highlights an interesting distinction in relation to age, as it positions young people as more interested in 'experimenting' and using external knowledge, as opposed to elderly community members who might be more conservative in their views.

6.3.2 Gender

Flood impacts have a strong gendered dimension. For instance, female participants explained that when the floods come, they are more vulnerable since they might be pregnant, and their traditional and culturally accepted clothing makes it more challenging to move in the flooding waters. However, gender also plays a role in the context of LK, especially in terms of women's role in knowledge sharing and transmission, as well as gendered differences in access to certain aspects to LK.

Across the case study communities, women are the ones who predominantly take care of the children (in addition to engaging in farming activities). Therefore, through day-to-day interaction with their children, participants saw them as instrumental in intergenerational knowledge transmission, depicted in the following excerpt from an FGD:

'Little children might pick up the porcupine and bring it to us. When they show us, we explain that it means there will be a lot of water. When a certain tree has a lot of fruit, we also tell them that there will be a lot of water.' (FGD F Kanseche)

It is common to identify women as a gender more vulnerable to natural hazards such as floods, especially when these women are poor (Ajibade et al. 2013). In Malawi, participants reported that female-headed households might be particularly vulnerable and that this can explicitly impose limits on how they access and use LK. For instance, house reconstruction after the floods for these women takes longer, since they might need to rely on paid labour to rebuild their homes. Furthermore, during the flood, these women will have to both move the property and pay attention to the safety of children.

The role of men was emphasised in regards to LK connected to construction practices, such as building temporary homes, raising the foundations and during the reconstruction process, where they play a leading role. As described in Chapter 5, in some cases, men stay in the lowlands while women and children decide to relocate with the belonging in the uplands; thus, this can place men in a more vulnerable position.

6.3.3 Education

Some of the participants also pointed out that those members of the community that are literate and have received some level of education are relying less on LK compared to those that did not. As narrated during the female FGD in GVH Tengani:

‘In terms of education, we can say that those who are illiterate rely on these [local knowledge] a lot unlike those who have gone to school.’

Through the process of education, people are exposed to new knowledge and ideas and education makes them *‘aware of more things unlike those who did not go to school’* (FGD M Kanseche). Education as a factor influencing use of LK had a very strong connection with the age (Section 6.3.1). Participants discussing education generally attributed it as one of the core factors creating an intergenerational gap in LK use, since young people attend school, as evident from the following quote:

‘When this generation goes to school they use temperatures and thermometers a lot. When they see the local knowledge they disregard it. Since the parents are older, they stick to the local ways.’ (FGD GVH Tizolo)

Moreover, it was also shared that individuals who went to school might express an attitude of LK being backward, for instance: *‘They will say these uneducated people will slow us down.’* (FGD F Kanseche).

6.4 Chapter summary

The analysis presented throughout this chapter provides a deeper understanding of LK in context, by revealing how members of communities view LK. More specifically, this chapter provided valuable insights on the process perspectives of LK, especially how LK is used and perceived and how it is produced and refined in its interaction with external knowledge.

People's views of their LK were previously not extensively considered in the literature, and this chapter presented the diversity of views in Section 6.1- indicating that knowledge holders value the agency of their LK differently. The results showed that they identify both the benefits and limitations of LK, thus suggesting that people assess their knowledge rationally and do not romanticise it. When used, LK helps them to be better prepared and to reduce their losses. They see it as easily understandable and available, and as a part of local culture. However, research participants in this study also clearly articulated the limitations of their LK and pointed out that it is not applicable to every situation. This type of insight is useful for a critical and realistic assessment of LK for CBFMR. Participants identified decreasing importance of LK, as it is changed and challenged by various processes (i.e. climate change, environmental degradation, population growth, penetration of new approaches and technologies) that directly influence the way LK is viewed and applied. These processes also influence how LK is produced (e.g. hybridisation of LK through access to technology) and refined (e.g. adding new layers of understanding through increased flood magnitudes).

Section 6.2 provided useful insights into the interplay between local and external knowledge, important to consider in contexts like Malawi, where local communities are heavily exposed to development projects. Thus, it was not surprising that LK was often contrasted with external knowledge, and people have identified a number of advantages and disadvantages of both. While external knowledge was seen as having a greater impact in terms of, for instance, more saved lives and greater reach of early warning information, people explained that it is often difficult for them to access it (due to cost) and to some this knowledge is distant, emphasising the importance of the local embeddedness of LK. However, it was also found that not everyone has the same access to LK, depending on one's financial capacity. The findings suggest that people ultimately use what is within their capacity (e.g. financial capacity determines what external knowledge can be

accessed) and what fits into their frames of understanding (e.g. seeing external knowledge as distant).

Furthermore, the results revealed that there are multiple ways in which LK is integrated with external knowledge, both at the individual level and at the community level, where CPCs play an important role. The process of integration is predominantly informal, and it was seen as a way to add more knowledge. Moreover, it was shown that before integrating or shifting to the use of external knowledge, people first test it and assess it through their experience. The integration aspect considered in this chapter offers another evidence of the dynamic and evolving nature of LK and how it is highly hybridised. However, taking into account the access aspect of LK, it needs to be emphasised that not everyone has the same access to triangulation.

In Section 6.3, this chapter has demonstrated the heterogeneity of LK use. Therefore, it sends a strong message that LK is not a unitary body of knowledge, but its use is determined by different factors, such as age, gender, and education, together with access to LK and exposure to external knowledge and training.

This chapter has demonstrated the importance of considering people's views on their LK in a process of CBFRM. For instance, through engaging with what knowledge holders see as benefits and limitations of their knowledge, it is possible to understand what aspects of LK are valid for people and thus can be built upon and encouraged to use through CBFRM. It can also reveal why some of the external actions fail to succeed; for instance, the complexity of factors described making people not leave their homes and farms upon being made aware of a possibility of a flood, and portrayal of external knowledge by some as distant and not understandable.

Finally, through accounts from community members, this chapter has started unpacking how external stakeholders (NGOs, government) engage with LK. It was shown that generally, people thought that their knowledge is underutilised and not appreciated. In order to get a full grasp of the position of LK within CBFRM, the following chapter will explore external stakeholders' views and engagement with LK.

Chapter 7- External stakeholders and local knowledge

This chapter characterises LK through the perspective of external stakeholders and builds its analysis predominantly based on the data collected through interviews and FGDs with NGOs and government representatives during the main period of fieldwork in 2017. In addition, interviews conducted with FRM consultants are included. The analysis presented herein contributes to objective three (on the use of LK by different stakeholders and their attitudes towards it) and partially to objective four (on developing recommendations for the enhanced use of LK in Malawi). This chapter starts with exploring the views of external stakeholders on LK (Section 7.1) and documenting their awareness of LK, its perceived benefits and limitations, and changes in LK. Section 7.2 provides empirical evidence on the existing use of LK, prior to offering a summary of recommendations by external stakeholders for the enhanced use of LK. Finally, in Section 7.4, the main findings from the chapter are summarised.

The results in this chapter are presented without separating the answers from different external stakeholders groups (i.e. government, NGOs). This decision was made as the data analysis showed that there were no substantial differences in the answers provided by the different stakeholder group. A slight difference was observed in insights provided by participants coming from different levels (i.e. local compared to national); it was observed that participants working at local (i.e. district levels) who are, by inference, ‘closer’ to communities, shared more practical examples of LK and how they use it in their interventions. However, in order to assess this difference and its potential implications, a further study is needed. For the purpose of this thesis narrative, this difference was not deemed significant.

7.1 External stakeholders’ views on local knowledge

7.1.1 Awareness of local knowledge

A starting point for positioning LK within CBFRM was understanding whether external stakeholders demonstrate awareness of LK. The analysis showed that their level of awareness of the availability of LK in the communities is high. Across all interviews and stakeholder groups, participants stated that LK is commonly found among local people and stems from long-lasting experience of flooding:

‘...Communities themselves, they are born here, they have been here for so many years. They have experience, and actually, when we look

at trends of floods [...] they started long ago. [...] Even long before any NGOs were there, communities were able to survive under such conditions.' (LNGO1)

Participants were asked to define LK in their own words, generally perceiving LK as the knowledge held by rural communities exposed to frequent flooding, including knowledge of predicting floods, responding to floods and self-organising in the absence of external help.

While sharing examples of LK they usually come across in the communities, it was evident that the majority of examples given were related to local early warning indicators. As stated by the government employee at the national level: *'If you talk about local knowledge, the first thing people will think of is early warning.'* (NLG1). As further explained by this participant, this is problematic, because it means that other, important dimensions of LK are often left out of consideration by external stakeholders. Taking into account the diversity of LK mapped in Chapter 5, it is apparent that LK is composed of more than EW indicators.

LK was often referred to as ancestral, having a strong cultural component, as it is a part of local tradition. Furthermore, it was described as knowledge that is *'brought out of experience and definitely born out of observation'* (NLNGO15). Some participants also pointed out that LK cannot be separated from everyday practices, mentioning that LK is *'things they [local communities] do, but they do not necessarily know it is local knowledge.'* (NLNGO2), confirming that LK is often tacit and cannot be taken out of the context of everyday practices.

Interestingly, only in one case was it mentioned that LK is evolving due to influences brought to communities from the outside:

'I would also not think of it as traditional completely, but there is also an element, because quite a number of these are influenced by other outside players. So what kind of knowledge do communities gain or benefit from with different interventions that other players are doing. [...] So it is both knowledge in terms of traditional aspect, what they have been using in the past and how they are using it on their own, but also knowledge influenced by external actors. Quite often there is a mesh between the two sources of knowledge.' (NLG1)

The general lack of acknowledgment among participants of the constant evolution coupled with seeing LK as traditional and ancestral indicates that external stakeholders in Malawi largely view LK as an unchanging and static concept. This is further

exemplified in the interview with an NGO member in Nsanje who stated that LK is ‘*not learning from other conventional methods and programmes that are around*’ (LNGO1). This example suggests that local communities are sometimes seen as passive subjects, as opposed to active learners capable of incorporating external influences and refining their LK.

According to participants, there is an overall increased interest in LK in flood-related work in Malawi, by all external stakeholders. Some participants shared that LK was long excluded from their considerations, but its importance has started being recognised in their agendas for several reasons. First, according to the interviewees from the government, is the decentralisation process (Chapter 4, Section 4.2.2) that required external stakeholders to engage more actively with the communities by following a decentralised institutional structure. Second is the increasing understanding that LK might add value to implemented interventions, as participants recognised that many interventions and projects have failed to be sustained due to ignorance of LK by external stakeholders. Third, as strongly argued by participants, since floods are increasing in frequency and severity, and climate change is expected to worsen the situation, all available knowledge, including LK, must be mobilised. Furthermore, according to some, increased interest in LK is due to understanding that the approaches that lack understanding of local contexts and priorities are not yielding satisfactory results (e.g. low adoption of the official warning information). Finally, participants pointed out that the increased interest in LK is due to the mainstream approach to development (including DRR and FRM) that advocates and promotes community participation as a cornerstone of successful interventions.

7.1.2 Benefits of local knowledge

When asked about the benefits of LK, external stakeholders pointed out several aspects of how LK is useful in their interventions, grouped under the themes presented in Table 7.1. In addition to these, participants also identified benefits that were described in Section 6.1.1 (e.g. LK as affordable, easily accessible and cultural); however, to a much lesser degree. Interestingly, it was observed that both external stakeholders as well as communities see the benefit of LK through how it can help them. For external stakeholders, this meant using LK as a way to deliver their projects in a more efficient and cost-effective manner, while for local communities it meant using LK to reduce their imminent losses, prepare them and employ familiar approaches.

Table 7.1 External stakeholders perceived benefits of local knowledge

| LOCAL KNOWLEDGE BENEFIT | DESCRIPTION |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Acceptance of external interventions and participation | LK as a tool to foster acceptance of external interventions in the communities and as a means of ensuring participation of community members |
| Local insights | LK offers valuable insights into local contexts |
| Fostering sustainability and trust | LK as a vehicle for implementation of sustainable solutions and trust between external stakeholders and communities |
| Cost savings | LK provides costs savings for external stakeholders |

7.1.2.1 Acceptance of external interventions and participation

A major benefit according to participants is that taking LK into consideration improves the acceptance of external interventions in communities. People put value to their LK, and if they see it taken on board during interventions, they will be more likely to accept them.

‘So, as a person, or maybe an NGO, if we trust information from them, whatever I bring to them, they have to accept it, and also just because they know I trust whatever they value.’ (LNGO7)

Interviewees especially argued for this point in terms of improving the existing early warning system:

‘When you just bring information to them, they are like, come on, that is science, it comes from mzungu [Malawian word for white people]. So they do not really trust the mzungu word, for some reason. They say it is just information from class, like school [...]. So, if they lose trust in modern technologies, help them by making sure that you are incorporating their local knowledge. Ok, one thing is forecast, but what does the ground say? Have the ants come out here? Oh yeah, we have seen them, so I think the government is right.’ (LNGO20)

Additionally, participants shared that collaborating with chiefs and implementing projects through VCPCs is beneficial, because other community members will be more likely to adopt new approaches if they see people of power and fellow community members being involved.

It was emphasised that communities are keener to participate in activities once when they feel that their LK is respected and taken into account:

‘If you consider that whatever they are trusting is true, it will be easy to work with them, because they will say someone is part of us’ (LNGO7)

For instance, participants pointed out the importance of following local customs: consulting village chiefs and using them as an entry point to the community, and female

development workers wearing traditional robe when working in the villages because it presents a sign of respect.

'If the development worker comes with their knowledge, you are short changing your own intervention, the result. Because you have ignored certain very important information. For instance, your approach in the community, the elders will know that this is not how you are going to approach the chief if you want to get results. In communities, there are cultural practices and restrictions. But now you know that women put on wrappers, and this is very traditional and very local. A female development worker cannot go there without a wrapper. If you are ignoring of these local practices, then even what you are focusing on, you won't even get in. Actually, it will hinder...Failing to recognise this local knowledge, they may sham your efforts. You may have brilliant ideas, but you can't be accommodated.' (NLNGO15)

Local people working with external stakeholders want to see that what they have proposed has been taken on board, as it makes them feel as equal partners in the process. Otherwise, as per interviewees, reluctance occurs and participation becomes a problem.

'The community, they would want to feel that their ideas have been incorporated. They want to see that what they have proposed has come onto board. Otherwise, if what they said, they do not see anything like what they have said, it is very difficult for them to be involved.' (NLC2)

7.1.2.2 Local insights

In the words of a government officer from Chikwawa, LK is a *'base or a take off point for us technocrats'* (NLG4). The agency of LK in terms of providing an in-depth account of local context was emphasised.

'You have to know the starting point if you are talking about anything. And especially if you are talking about behaviour changing, you need to know what people know already, to be able to know whether it is a right thing you need to be reinforcing, or whether there are certain things that maybe we should be trying to change.' (NLNGO12)

This thought was echoed throughout interviews, where participants shared that the input from communities on flood behaviour in their localities is important, especially in a country where there is no *'luxury to check what you are doing'* (NLC1), due to a lack of data. This indicates that external stakeholders recognise the potential of LK as a way to gain and generate additional data for FRM. An example of how LK improved FRM consultants' understanding of local flooding was shared:

'Mufale [GVH in Chikwawa] is a great example where I assumed that flooding was from the Shire. [...] The Shire has a low gradient, so I

expected it would be the same [flood depths across the village]. In the village, they were reporting different levels across the village. And at first, I did not believe, I thought it is rubbish and it cannot be, that must be a mistake. But then it turns out that actually the flooding is not from Shire, it is from Illovo offtake, and yes, then it makes full sense.[...] So, yeah, what they said made sense in the end.’ (NLC1)

Furthermore, one participant mentioned that by consulting local people and tapping into their experiences, better approaches can be taken, because people have seen the failures of other development projects in their localities, and can share valuable lessons learned.

‘Local people, they know how to plan things [...]. They have experience on how flood happens, because they have been there all along [...] And they have seen works happening and failing [...] so from that they have gathered at least something that they can advise and tell, you can do this, we saw some other guys did it and it failed. So if you can get their knowledge and use it in your works, it helps.’ (NLC2)

The previous two quotations of the FRM consultants indicate that LK has a great deal to offer when it comes to implementing FRM projects in the communities. However, it needs to be noted that the approach taken by the consultants on this specific project was characterised by general appreciation and inclusion of LK, which was rather an exception than a rule, as presented in Section 6.2.3 and further elaborated in Section 7.2.3.

7.1.2.3 Fostering sustainability and trust

As explained by one of the interviewees (NLG1), if projects are designed detached from the local context and in the ‘offices’, people in the communities will refer to it as an NGO project, not ‘our’ project, indicating that project sustainability, identified in Chapter 4 as one of the main challenges, might be compromised. Generally, interviewees argued that integrating LK contributes to ownership and sustainability of projects. In other words, it improves project effectiveness and impacts. When local priorities result in actual projects on the ground, and local capacities are accounted for, communities are more keen to sustain projects over a longer timeframe.

‘The main benefit of integrating local knowledge to me, I feel it is ownership, because local people, they own their knowledge, so when you go and use their knowledge, they are able to participate in activities because they know that the knowledge that is used in projects is their own knowledge. If it flops, it is their knowledge that has flopped, so they will do everything to make it work.’ (LNGO5)

What this example suggests is that incorporation of LK can also serve as a tool to motivate community members to be active. Furthermore, being sensitive about LK builds trust between community members and external stakeholders:

'Communities will know to say, this extension worker or this organisation is also realising the importance of our local knowledge, and they are trying to apply it when they are implementing different interventions. So, that kind of linkage, or that kind of collaboration between the extension workers from the NGO and the communities brings that unity whereby you bring a lot of impact to that area.' (LNGO18)

7.1.2.4 Cost savings

Mentioned to a lesser extent compared to benefits described thus far, when LK is a basis for external interventions, significant cost savings can be realised. For instance, if local people are using their LK and external stakeholders are aware of it and reinforce it, then there is no need for extensive trainings, whose organisation is costly. Furthermore, making sure to get information on flooding dynamics from the locals optimises the costs of building the dike, as it can assist in positioning the dike in the right location, thus maximising its impact. One NGO member highlighted the cost-effectiveness of preparedness activities based on LK:

'So if they have the knowledge and they know how they can get prepared for flood themselves, and they prepare themselves, they have a place to go when the floods occur, and they have where to start from, they have some food, some utensils, that is also cost effective to the NGO. Because it means the support will just be very little.' (LNGO6)

7.1.3 Limitations of local knowledge

In spite of the positive perceptions of LK amongst external stakeholder participants, the limitations of LK were mentioned more often than the benefits. These limitations were grouped under six themes, summarised in Table 7.2.

7.1.3.1 Lack of evidence

According to external stakeholders, the biggest identified limitation of LK is a lack of evidence of its effectiveness.

'We can't just say they are not effective, but I think we need further assessments, to see if it is effective. You know, there should be some scientific connection in terms of how things relate on the ground [...] I think as a country, as a district, we need to do further assessment.' (LNGO16)

Table 7.2 External stakeholders perceived limitations of local knowledge

| LOCAL KNOWLEDGE LIMITATION | DESCRIPTION |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lack of evidence for LK | There is no available evidence for LK. Evidence includes scientific validation of LK, as well as evidence in terms of LK being validated in real time (i.e. observing effectiveness over a given period of time) |
| Spatial confinement of LK | Place-specific nature of LK presents a limitation because it makes it challenging to package it and upscale. |
| Lack of documentation of LK | LK is not documented and as such it is difficult for external stakeholders to access it. |
| Heterogeneity in knowledge possession and use | LK is not equally distributed within a community, not everyone is using it the same. There is a gap in generational use and possession. |
| Accuracy and applicability of LK | LK has questionable accuracy and reliability, it is not applicable for all levels and magnitudes of flooding, and it does not work well in unknown conditions and with increasing changes (e.g. climate change, environmental degradation). |
| Negative implications of LK | Certain aspects of LK can hinder individuals' safety. In addition, LK can negatively influence external stakeholders' initiatives at community levels. |

Participants argued that the absence of evidence presents a major obstacle for integrating LK in their approaches. As evident from the previous quotation and through the analysis of transcripts, by 'evidence', people were primarily referring to scientific evidence (e.g. scientific methods confirming the utility of LK). To a lesser extent, in some instances, evidence was referred to the fact that there is no time-tested evidence that LK works (e.g. local EW indicators forecasting flooding being confirmed by actual flooding occurrences).

Generating evidence was seen as needed to recognise LK as a valid form of knowledge: *'Some of the things are not scientifically proven, and difficult to build them into a normal project plan.'* (NLNGO9). As several participants pointed out, LK is not going to be considered as a valid knowledge type until it has some scientific backing.

'As an organisation, we do not use the knowledge, but we appreciate that there is knowledge. But you know, for us to use that knowledge, then it requires the evidence.' (LNGO16)

For instance, a member of the District Civil Protection Committee in Nsanje pointed out that local EW indicators cannot be accepted without prior scientific grounding, since he felt that they would be *'putting peoples life at risk'* (LG12).

'Us, people who are planning development activities, we would like to know that there is something that makes sense, scientifically. But for local knowledge, there are things that cannot be explained, what is happening. If I go there and see that it is not true, but people still believe in it, and I feel like it is not true, then I may be not even listen to it. So in that case, I am just ignoring it, because I do not believe in it personally. Unless someone studies these things, documents them and convince us: this thing has an explanation and this is how it works. Then we would look at it with another eye and we would start believing it, and start factoring into our plans.' (NLNGO9)

Interestingly, participants pointed out that the lack of scientific evidence makes it difficult to build a case for LK with donors, directly influencing the extent to which they can incorporate LK in their approaches (i.e. CBFRM), which will be discussed in detail in Chapter 8.

'If the donor has got some funds, then you say we are going to implement this project using local knowledge, maybe he will also ask to provide proof whether that will work or not. So if you got the challenge, they will say, why not just to use modern technologies where we are guaranteed that once when we implement a,b,c,d, we will have a,b,c,d as a result.' (LG11)

7.1.3.2 Spatial confinement

The place-specific nature of LK was one of the most commonly mentioned limitations of LK. Participants shared that LK is different between different locations, but can also mean different things in different locations. Therefore, in their view, LK is hard to generalise and *'it contradicts even within the same area'* (LNGO8).

'One of the issues with LK is that some of them are area specific, so you can't generalise the LK [...] But when you look at the scientific knowledge, it is something that can cut across. So that has been a challenge in terms of trying to generalise the kind of intervention' (NLG1)

This quotation also indicates a direct contrast with scientific knowledge, which is seen by participants as universal and something that is 'valid' independent of spatial location, possibly indicating an uncritical view towards scientific knowledge and even a preference.

The varying pattern of LK presents a *'frustrating issue'* (NLG10), and it makes it a challenge for external stakeholders to understand the validity of LK. As raised by LNGO17: *'With those variations, area to area, it gives doubt to say: will this be a real*

situation?’ The place-specific nature of LK was especially a challenge in terms of local EW indicators.

Similar to the lack of evidence, this place-specific nature was identified as a significant obstacle for the enhanced inclusion of LK in CBFRM. According to participants, accessing and understanding LK is time and resource intensive, as evident from the following quotations:

‘One thing I have observed is lack of uniformity among these local knowledges. You find that if you go to another area, they are going to tell you once kind of local knowledge, you are going to another area, there is something different. So I think to use all this knowledge, to come up with a programme, I think it is very difficult. That is why we normally depend on scientific knowledge which has been proven to be effective.’ (NGO FGD, Chikwawa)

‘I think, purely pragmatically, for a lot of us, time is an issue, to try and really understand it. You get a bit of funding and you have a certain amount of time to deliver something and you have to achieve certain results, and the time taken to really understand some of these issues is not always there.’ (NLNGO12)

7.1.3.3 Lack of documentation

The fact that LK is not documented was another limitation often identified, showing a similarity with what communities identified in Chapter 6. As narrated by NLNGO15, the ‘knowledge is with the people’.

‘So the biggest challenge is [that] you know there is knowledge, but we do not have it documented somewhere to refer to.’ (NLNGO9)

Participants explained that since there is no documentation of LK at local levels, it is difficult for them to access it and develop a full understanding of different dimensions of LK available in the community where they are implementing a project. Yet again, and similar to participants from communities, a contrast was made with scientific knowledge, which was seen as more accessible since it is available in a written form.

‘I think often what we do is we just talk about existing LK, but if you look at scientific knowledge there is a proper record of that in terms of maybe there is a flooding, this is what you do, how to reduce it or how to respond it, or how to recover from it. It may not be one repository but it is something that is available, and maybe accessible. But when you talk of LK, there is inadequate documentation of what is available, what is existing in areas, what are the practices.’ (NLG1)

Consequently, this presents an obstacle for incorporating LK, since, as previously explained, external stakeholders are limited by time and resources.

7.1.3.4 Heterogeneity in knowledge possession and use

Participants pointed out that LK is often limited to certain individuals within a community, especially elderly people, also recognised as the main knowledge holders by communities themselves. However, as explained, these individuals are rarely involved in project design and implementation as they are not often found in VCPCs. Therefore, participants felt that it is challenging to get access to communities' LK.

There are some people, maybe one or two in the village that are good in these indicators. [...] There are some maybe old guys that were talking about so many indicators, and they come time, maybe some of them, they are consulted by the local leadership, maybe like what is likely to happen. [...] But you find that maybe those people that are able to do that are few, so that is a limitation. (NLG10)

It was often emphasised that people in the community have different knowledge and use knowledge differently. For instance, participants identified an intergenerational gap in knowledge possession and use, and raised concerns of elderly generations passing away with LK not being transferred nor documented. It was constantly re-emphasised that younger generations are abandoning LK.

'The other thing I could say, I hope I am not freaking out, but... Most of our elders are gone, going many a day. [...] Who is remaining? The youth generations with our interests, different interests. For us to be keeping such knowledge, it is not easy.' (LNGO10)

Interestingly, participants did not demonstrate acknowledgment of the other factors differentiating the use of LK in communities, compared with what the communities themselves identified (Chapter 6). Only in one instance was it mentioned that the women might have different knowledge. However, due to their cultural position, they are not in a position to share it in the presence of men.

'Women can have the knowledge but they cannot say it out, because they are always submissive. And according to our culture, women are not supposed to speak when there is a man [...], they are only supposed to keep quiet. Even if they are knowledgeable.' (LG2)

Although failing to fully recognise the heterogeneity in knowledge possession and use, participants did point out that heterogeneity presents an obstacle for them to incorporate it into CBFRM, since it requires time and resource intensive participatory activities.

7.1.3.5 Accuracy and applicability

The accuracy of LK for FRM was challenged on several fronts. Based on his experience of working in with flood vulnerable communities in the Lower Shire Valley, an international FRM practitioner argued that, in terms of planning technical solutions for FRM, LK is quite inaccurate:

‘One of the things with local knowledge, it can tell you what happened in the past, but it cannot necessarily project what will happen if you change things for the future. If you say, if we put a dike up here, what would happen, if you did this, what would happen.’ (NLC4)

This suggests that LK is limited in the face of ‘unknown’, as it is based on previous experience, and resembles the accounts of communities from Chapter 6. Similarly, according to the interviewees, local people lack technical expertise to assess the viability of a specific FRM solution. For instance, NLC3 shared that people often ask for river dredging, without understanding that this is not a sustainable intervention when taking into account the siltation rates in the Shire River basin.

It was further explained that LK is very useful for understanding flood dynamics at the local scale (i.e. the ways in which water arrives in the village and behaves). However, it is not very accurate when it comes to providing the actual flood depths. According to this participant, people tend to exaggerate, under the influence of chiefs, hoping their village will receive more assistance:

‘Very often, you find that you go back when we first arrived there, and we talked with the VCPC and you walk around and then you would say how high the water get and they would sort of lock on their houses. And then they go back and talk to the chief and say these guys were there, and the next day you go back and ask them again, and suddenly it is like good half meter to a meter higher.’ (NLC4)

Another often expressed limitation regarding the accuracy was the reliability of local early warning indicators. External stakeholders questioned whether local EW indicators can serve as a reliable indicator of an upcoming flood, which is in line with the findings from communities (Section 6.1.2.2).

In terms of the applicability of LK, two main aspects were revealed. Firstly, similar to insights from communities, some participants felt that LK is not applicable for all types and magnitudes of flooding. NLC3 pointed out that flash floods present a problem for LK, since water comes suddenly and from higher elevations. In terms of magnitude,

extreme floods were seen as an issue for LK. An interviewee from the local government in Nsanje (LG8) shared his experience of 2015, when people in a certain GVH decided to stay in their locality, despite receiving the warning message, because they never experienced flooding in that part of their community. Secondly, several interviewees mentioned that LK is limited in dealing with external pressures (i.e. climate change, environmental degradation, population growth):

'Practices that worked 30, 40 years ago in terms of local knowledge, would not really be as effective as they were 40 years ago because of the number of issues, like population growth, issues of maybe deforestation, land degradation, the issues of climate change are now coming in that may affect the traditional way that we used to do.' (NLG1)

7.1.3.6 Negative implications

To a lesser extent compared to other perceived limitations, participants also pointed out that LK is not necessarily always beneficial for its holders and users and in certain instances, it can even compromise peoples' safety. An interviewee shared an example of 2015 floods:

'People say floods come from this month to this month, and usually they say it is February or March, and this January flood was on the 17th January. The District Council, after noticing that there will be floods, they went with megaphones telling people to move to uplands, people were laughing. How come we will have floods in January? We had never had floods in January. That is why more people were trapped and we had more deaths.' (NLC3)

This indicates that due to possessing LK (developed through previous experience) people can sometimes be reluctant to appropriate new information since it does not align with their local understanding, thus compromising their own safety.

Connected with external stakeholders understanding that LK has a strong cultural component (Section 7.1.1), some participants identified the negative implication thereof. Some interviewees explained that LK is an impediment to the resettlement of communities, because local people have a strong sense of place attachment (e.g. do not want to abandon the graveyards) and do not understand that the intervention has the aim of providing safety (e.g. thinking that the government wants to 'steal' their land). A useful perspective was provided by an NGO staff member from the national office:

'Something I struggle little bit is really, trying to see what do we mean by knowledge, where does it begin and end. Is it kind of belief in a fact, belief in a sense if I see the ants there will be floods, or are we thinking

more about just the way people relate to their community? Like where do you consider local knowledge is, what are the boundaries of it? Just an example: if people do not want to leave their land because they feel they lose something. That is not local knowledge as such, it is such a strong belief that would really impact whether they would get to safety or not. But this thing is important when you are considering flood management. ' (NLNGO12)

This example identifies an interesting aspect as it indicates that the very notion of LK has many layers, from specific aspects such as EW indicator to a larger, cultural component, where people feel attachment to the land they are residing and farming at, and where their ancestors are buried. Therefore, this complexity of meaning might at times be in contradiction to what a conventional FRM approach, such as resettlement, might advise.

7.1.4 Changes to local knowledge

Similar to the community views presented in Chapter 6, external stakeholders felt that community reliance on LK might be decreasing, as LK is pressured by environmental change and penetration of new approaches and technologies.

Firstly, participants pointed out that LK is challenged by environmental change, namely environmental degradation and climate change, influencing both the reliability and accessibility of LK. As per participants, the influence of environmental degradation on LK manifests itself in some of the tree species being used as local early warning indicators not being available anymore, and some of the animals used for the same purpose migrating to different areas.

Climate change impacts on LK were seen through a lens in which LK is based on observation and as such is prone to uncertainty in a changing climate, where communities are exposed to changing climatic behaviours. Factors perceived to be related to climate influencing the reliability of local EW indicators were pointed out, including changing rainfall patterns and shifting timing of flood occurrence. Furthermore, it was noted that climate change influences the frequency and magnitude of flooding. These were all in line with community views on changes in LK (Chapter 6). According to participants, all of these are causing 'confusion' in communities when it comes to the applicability of their LK. Moreover, impacts of climate change on LK were identified as one of the prime reasons for generating scientific evidence for LK, as well as for more integration between LK and scientific knowledge.

Secondly, penetration of new approaches and technologies in communities, brought by external stakeholders (e.g. official EW information, mobile phones) changed the way communities feel about their LK. This indicates that external stakeholders recognise their influence on LK, and is in line with findings from Chapter 6, where communities clearly articulated that external interventions are changing the way they view and use their LK. In words of NLGO1, *'technology is good in a way, but it is at the expense of the local knowledge.'* Similar was suggested by a representative of the national government (NLG7) when mentioning that LK is suppressed by NGOs due to favouring scientific and professional approaches, hence making local people believe that their knowledge cannot work, thus undermining their confidence in their LK.

7.1.5 Unrevealed attitudes: local knowledge as backwards

As presented in this chapter thus far, the participants of this study looked at LK critically, by both emphasising its benefits and limitations. Many participants pointed out that individuals and organisations involved in community-level and development work perceive LK to be inferior and backwards, evident from the following quotations:

'I think there is a bit of arrogance in a way. [...] There is a bit of that attitude in all of us. They are taken as beliefs, superstitions, things like those. They are not valid to some other people.' (NLNGO12)

'The 'knowers' like myself and yourself generally despise local knowledge.' (NLNGO7)

This is in line with the community perceptions of external stakeholders attitudes to LK presented in Chapter 6. Interestingly, when talking about LK as backwards, participants were never expressing that as their own view, but rather as what they perceive to be a general attitude of development community towards LK. These were interpreted by participants to stem from local people being perceived as uneducated; thus their LK cannot be of value for finding solutions for flooding problems. According to some participants, LK is seen by many as an *'uncivilised way to do things'* (NLNGO1), and some *'pretend as if whatever they [communities] are doing is useless'* (NLNGO10). As described by NLNGO10, there is no appreciation for LK and this impedes the positive contributions LK could add to interventions implemented in communities. According to the same participant, among the development community, the word 'local' is often associated with *'low value'*, serving as another explanation of why LK might be overlooked. Moreover, in the current system, people go to communities with the

mentality that they ought to be taught (NLNGO13), suggesting that LK might not be looked at as a useful form of knowledge.

Central government employee NLG1 offered an interesting explanation of these negative attitudes. In his view, it is because external stakeholders see vulnerable communities affected by flooding on an annual basis, thus raising questions about the effectiveness of LK. This might suggest that these stakeholders fail to fully consider the vulnerability component of the risk 'equation', as communities are affected not only because they are exposed to a hazard, but also due to a fact that they live in marginalised land and lack resources to protect themselves. As explained in Chapter 6, even LK is not equally available to all, depending on their financial capacity.

In addition, other explanations are seeing scientific knowledge as dominant, as previously explained, and there is also the fact that the education levels of those working with communities and communities themselves are so different. Finally, some participants pointed out that external stakeholders might simply lack understanding of LK and gave that as a reason for limited incorporation of LK:

'It is not like I am saying that local knowledge is not important. It is, but maybe we do not understand it, some of the concepts. Because we do not understand them, we are not able to capture and to appreciate and plan in line of such type of knowledge.' (NLNGO9)

This suggests that individuals coming to implement CBFRM projects, as outsiders to these communities, might lack understanding of the principles on which LK is based; thus, making it challenging to fit it into their own frames of understanding.

7.2 External stakeholders' use of local knowledge

Since this thesis attempts to understand the role of LK in CBFRM, it is important to take stock of its current usage. Examples of how LK is currently used in flood-related projects at community levels were shared by participants. These generally fall under two categories: explicit and implicit. The category of 'explicit' refers to examples given in which the use of LK is more concrete in the process of intervention design and implementation. On the other hand, examples of 'implicit' use refer to less structured approaches of using LK.

7.2.1 *Explicit use of LK*

The summary of answers to whether and how LK is currently included in approaches taken by external stakeholders is provided in Table 7.3.

Table 7.3 Examples of explicit use of LK by external stakeholders

| CATEGORIES | DESCRIPTION | EXAMPLES |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local level planning | LK is used to inform development of Contingency Plans and other documents at community levels. The process is facilitated by NGOs and government, whereas the main actors in developing Contingency Plans are VCPCs. | <ul style="list-style-type: none"> - documenting local early warning indicators in Contingency Plans - coming up with strategies for FRM based on community preferences (e.g. planting trees, building dikes, finding safe places to evacuate) - Contingency Plans as basis for future projects in communities - Consultants developing Village Flood Action Plans at Group Village Head and Traditional Authority levels - Consultants sourced information on flood depths from local people in order to calibrate flood models - As a part of Participatory Scenario Planning exercise (PSP), developing seasonal scenarios partly based on LK |
| Participatory Vulnerability and Capacity Assessments (PVCAs)* | PVCAs, as a common tool used in CBFRM serves as a basis for eliciting LK from communities, according to the interviewees and FGD participants. | <ul style="list-style-type: none"> - identifying vulnerable segments of community - identifying existing capacities in communities - coming up with hazard and risk maps - producing Contingency Plans - identifying project beneficiaries - VCPCs conducting PVCAs - coming up with historical profile of flooding |
| Awareness raising campaigns | LK on early warning used to improve the dissemination of seasonal forecasts issued by the Department of Meteorological Services and Climate Change. Awareness- raising campaigns are conducted by NGOs and members of the local government. | <ul style="list-style-type: none"> - When conducting meetings with VCPCs, in order to raise awareness of the possible upcoming flood, people are asked to share their local observations, as a way of triangulating different sources of information. |
| Use of local materials and workforce | During project implementation phase, local community members are involved in construction works and local materials are used. | <ul style="list-style-type: none"> - Locally sourced sand and stones - Local workforce for building dikes |

| CATEGORIES | DESCRIPTION | EXAMPLES |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Improving local methods | External stakeholders build onto existing methods in communities and improve them. | <ul style="list-style-type: none"> - megaphones to improve informal warning message dissemination - providing cement to build stronger dikes - bringing excavators for dike construction - connecting VCPCs with technical experts from the government in order to refine ideas for flood reduction projects - building permanent evacuation structures taking local preferences into account |
| Local leaders as entry gate-keepers to communities | The important role and power local leaders hold is acknowledged by external stakeholders. Chiefs are consulted and involved across different project phases. | <ul style="list-style-type: none"> - chiefs as guests in local radio station that provides advisories for people living next to the river banks - using influence of chiefs to catalyse change in communities - chiefs as leaders in permanent relocation |

* Contingency Plans are produced as a part of PVCAs done with communities. However, since Contingency Plans present an important local level planning document, in this Table they were presented separately.

According to participants, LK is included in local level planning, done jointly with VCPCs. Planning exercises are facilitated through using participatory engagement methodologies, commonly applied in development work since the 1980s. Furthermore, often mentioned was the use of LK as a tool for improving awareness-raising activities. Participants explained that when conducting awareness-raising, they ask members of VCPCs to share their LK related to early warning indicators. By doing this, the scientific information upon which the meetings with communities are initiated is triangulated with local observations. The rationale behind this approach is that community members will trust scientific information more if they can relate it with their LK.

Another interesting aspect of the use of LK are examples in which participants were saying how they ‘bank on’ the existing LK by just marginally improving existing approaches within communities. For instance, it was explained how local warning dissemination practices were improved by introducing megaphones to communities, and dikes made of local materials strengthened by adding cement. Furthermore, participants emphasised the importance of using locally available resources and the local workforce, as a way of creating ownership of local communities, thus contributing to project sustainability. Finally, reaching the larger community through local leaders was seen as instrumental, since chiefs are powerful in rural communities.

In addition to participatory approaches that present a standard methodology to elicit LK, participants were very enthusiastically referring to Participatory Scenario Planning (PSP), as the ‘*best entry point for local knowledge*’ (LNGO1). PSP is a methodology used for incorporating seasonal climate information into decision making, a fairly new methodology in Malawi. It is used by several NGOs that are part of a larger consortium for a specific project (the exact name of the project is not shared due to data privacy). In summary, the Department of Meteorological Services and Climate Change (DMSCC) releases seasonal forecasts in late September, with a spatial scale of a district. Upon the release, meetings are organised with VCPCs in communities that are beneficiaries of the project. Next to VCPCs representing communities, extension workers from different governmental departments are present (e.g. agriculture, health, social welfare). Together, they analyse the possible implications of the forecast for a specific community. Based on these discussions, different scenarios are developed, including the actions that can be taken (e.g. cultivating water-resistant crops, moving out of the flood prone areas). External stakeholders involved in PSP explained that in these planning meetings, they will share seasonal forecast but will also ask community members what the projections of the upcoming season are based on their LK. After triangulating the projections, they will proceed to collaboratively plan how to approach different scenarios. As explained by NLNGO5, PSP is beneficial because communities are empowered to share their projections, and in such an open forum ‘*it becomes easier for us to present to them scientific knowledge, because we have gotten their knowledge first.*’

7.2.2 Implicit use of LK

Interestingly, in many cases external stakeholders were using the word ‘*encouragement*’ to describe ways in which LK is considered in their work. This was especially evident in the answers provided by the interviewees from the local government and NGOs based in the districts.

‘We are not like... We are only promoting by the way of encouraging them to use the, the local knowledge, the knowledge they have in forecasting of extreme disasters or extreme weather. We are not necessarily training them, or maybe sharing with them some of the local knowledge that they can use, because we are not experienced or we do not have much expertise in that area. It is them who have the knowledge, so we are also encouraging the use of that knowledge. That they should not abandon it as the different ways of forecasting are coming in projects.’ (NLNGO14)

The encouragement of community members to use LK was seen as a way to increase the acceptance of scientific information coming to communities (mainly in terms of early warning information). Participants explained that they advise people to still continue observing their LK, share it with their fellow community members, but also to triangulate it with the information coming from external sources. These insights were in line with what was shared by community members in Section 6.2.3. One interviewee (NLG10) pointed out that the encouragement is needed because people in the communities are the first responders, and it is therefore important for them to rely on what they know prior to arrival of external stakeholders after they have been hit by a flood.

The implicit use of LK through ‘*encouragement*’ indicates that external stakeholders recognise the utility of LK, mainly in two aspects:

- i) in the absence of external assistance, and
- ii) as a way to foster acceptance of scientific information.

The nature of ‘*encouragement*’ further illustrates the *ad hoc* use of LK, possibly missing the benefits of a more structured approach. For instance, in terms of local EW indicators, a two-way information sharing approach in which external stakeholders would document local indicators could improve the existing practice.

7.2.3 Lack of integration of local knowledge

The results presented above illustrate ways in which LK is used and integrated into external approaches, either explicitly or implicitly. However, as admittedly pointed out by participants, this integration is currently limited, and LK is underutilised in current CBFRM in Malawi.

‘It is like local knowledge is being done separately, they are doing their own thing. The scientific knowledge, they are also working on their own. There is no room for these two to come together or converge and discuss and see how best they can be intermingled, or they can be blended so that we move forward together. I think that is the opportunity that we are missing.’ (NLNGO6)

This sentiment was echoed by most of the participants. For instance, NLNGO7 bluntly stated: ‘*Frankly, local knowledge is not used much in our projects*’, while the government employee NLG2 pointed out the interventions implemented at community level do ‘*not take much into account what the locals know*’. Moreover, LK is often overlooked in

favour of scientific knowledge, indicating the unequal power relation between local and scientific knowledge.

‘Because at the moment it is like, there is that conflict, it is not being seen, but there is that conflict, because there is overreliance of the scientific knowledge [...] They [external stakeholders] don’t really recognise the local knowledge which is in the communities, which for the communities, well communities have always been there, they have been providing right information.’ (FGD participant NGO Nsanje)

Data from the interviews also revealed that interventions at community levels are primarily based on scientific knowledge. For instance, it was shared that during the design of community-based early warning systems (CBEWS), the thresholds for triggering warnings are determined based on hydrological analysis, with no consultations of local people. Similarly, the decision to conduct awareness meetings and conduct planning exercises (e.g. PSP) is made based on scientific forecasts, with LK just being a convenient ‘add-on’. The quotation presented above and these examples indicate that although there is a rising interest in LK (Section 7.1.1), the translation of this interest into practical applications is currently limited.

Similarly to experiences from communities (Section 6.2.3.), several interviewees from external stakeholders recognised the negative implications of not considering LK in the design of projects, thus missing out on the rich knowledge, identified in Chapter 5, that local people have regarding floods behaviour in their area (Chapter 5).

‘They [the government] were building a bridge this side. The people were telling them: “This bridge you are building here, when floods come, this will not stand. It will be taken away. The passage for water that you have put is too small. We have volumes of water, and this one, is going to be washed away.” But they said: “No, we are engineers, we have gone to school, we know what we are doing.” But these local people, they never went to school, but they had this knowledge to say: “As far as we know, in terms of capacity of water which passes through here, this would not stand.” Came the rain, floods came. The first thing which was washed away, it was that one.’ (LNGO19)

Another participant argued that the lack of LK incorporation, generated through a generally poor facilitation of community participation, which connects with the findings from Chapter 4, results in failure of projects on the ground:

‘Most of the projects that failed in the Lower Shire, it is because NGOs came and said we want to do this, we got funding and we want to assist you with this. This is a problem and this is a solution, and this is the

money with which we want to build. Because they do not involve the communities themselves, usually the projects fail. ' (NLC2)

Furthermore, insightful examples of the mistakes made by not considering local insights during the response of 2015 floods were shared. For instance, LNGO20 shared that local perspectives were not taken into account in the organisation of evacuation camps, since women and men were sharing the same toilets and women and men from different households were staying in the same accommodation. Due to this, there were even issues of women and child abuse (NLG4). According to the same interviewee:

'You have donors coming in to deal with floods. You find that they have funds and they have rules on how to use those funds, so they cannot change. You find them bringing stuff, sometimes the stuff that is not even needed or required in the areas. But just because that is how it has arrived [...], nobody can say no'.

This example exemplified the previously mentioned issue of donor-driven agendas that, at times, operate detached from the local contexts.

While this section looked at how external stakeholders use LK and brought evidence that LK is underutilised, the following section will introduce their views on how the situation could be improved.

7.3 Externals stakeholders' recommendations for enhancing the role of local knowledge

External stakeholders were asked to identify what are, in their opinions, ways in which the role of LK can be enhanced in the existing system, who should be involved in this process and what would be possible impediments. The main themes emerged are presented in Figure 7.1. The recommendations discussed in this section do not present the ultimate recommendations from this research on how to enhance the role of LK in CB-FRM in Malawi (these will be presented in Chapter 8), but rather present the insights into the needed improvement through the lens of external stakeholders.

As a precondition for any enhancement, participants identified a need for improving the existing community engagement practices, extensively critiqued in Chapter 4. In their views, this includes widening participation from a mere consultation of VCPCs, enhanced inclusion of communities in project design and implementation, as well as changing the existing policy making practice towards more bottom-up approach.

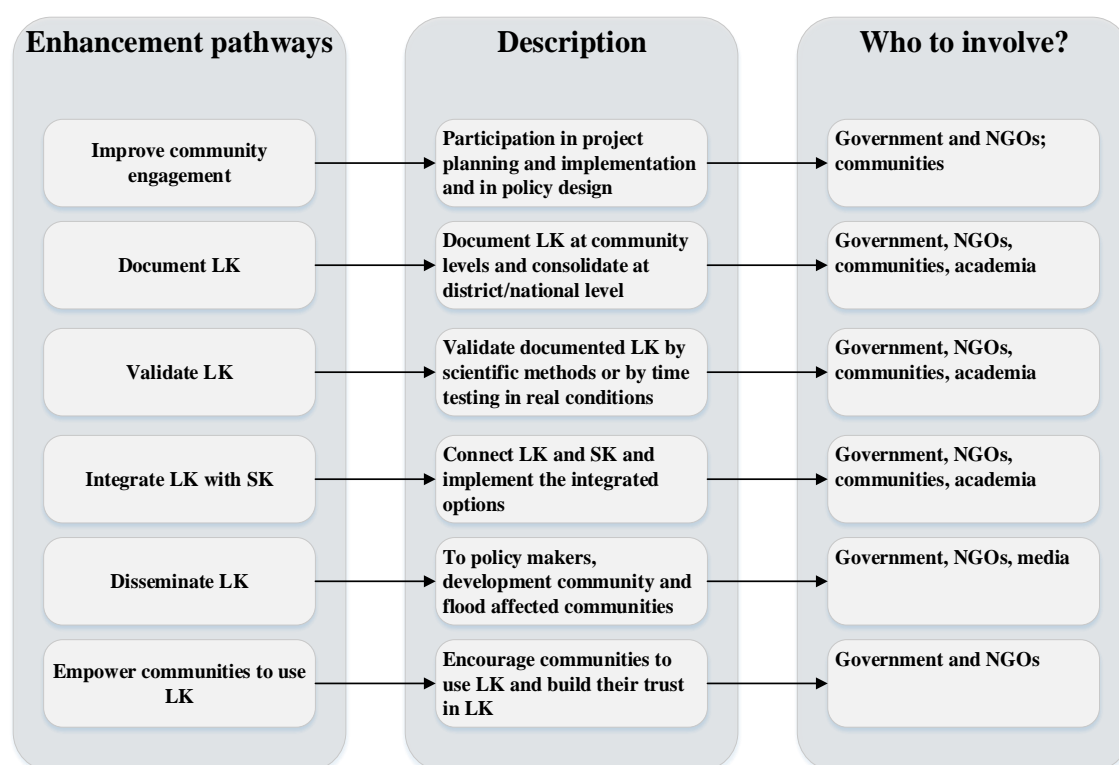


Figure 7.1 Overview of external stakeholders' recommendations for enhancing the role of local knowledge²⁸

Not surprisingly, and taking into account the identified need to generate evidence for LK (Section 7.1.3.1), the most important step according to participants is to document and validate LK.

'We need to document and validate. That is the key. Because you can't just [say] this is how it works, but we need to validate it. I think that is one area that we can focus.' (LNGO16)

As strongly argued by participants, building a case for LK at professional and policy decision-making levels requires that the utility of this knowledge is proven. As put by one of the interviewees:

'Our approach is top-down in terms of policy formulation. For the centre to adopt local knowledge, unless it backed by well-researched knowledge: this is real, and it can work.' (LG5)

There was an overwhelming consensus for a need to integrate LK and SK. According to the interviewees, taking into account the severity of flooding problems, it is important to utilise all means available. As voiced by an FGD participant from NGOs in Nsanje: *'We are talking about disasters and we cannot take chances'*. Two main reasons for

²⁸ The recommendations in the Figure 7.1 are not listed in the order of priority (i.e. the number of times mentioned by interviewees); they are listed in the form of a process.

integration were emphasised. Firstly, people felt that communities still place more importance on their LK compared to SK, which is in contrast with communities' views from Section 6.2.1, where it was shown that local people identify both benefits and weaknesses of LK as well as SK. For some of the external stakeholders, people place more importance on LK due to the fact that the levels of illiteracy are high in communities, hence it is challenging for them to understand concepts developed on scientific principles and they prefer to stick to the ways that worked for them in the past. Interestingly, others suggested that this is because people do not trust in what the external stakeholders bring due to previous failures of interventions in communities or (specific to warning messages) inaccuracy of official warnings. Secondly, a need for integration emerges due to perceived limitations of LK in the light of external pressures such as climate change and environmental degradation (explained in Section 7.1.4).

It is also important to emphasise that in terms of knowledge validation and integration of LK and SK, focus was primarily on local EW signs, suggesting again that other dimensions of LK are overlooked. Participants repeatedly called for more research, through which these signs need to be documented and after that validated, either through finding scientific explanations or through testing in real-time conditions (i.e. seeing that signs indicating certain type of behaviour happens). At times, it was challenging to distinguish the difference between 'validation' and 'integration between SK and LK because integration was often presented as a process in which the utility of LK is confirmed through finding its scientific explanation. However, some participants, to a lesser extent, did refer to integration as a process in which LK can improve the acceptance of external intervention (e.g. communicating seasonal forecasts by contrasting them with locally observed indicators; building onto and improving already existing practices).

According to participants, once the LK has been validated, and thus an evidence-base built, there is a need for wider dissemination of LK to multiple audiences (i.e. all stakeholders involved in FRM). As noted, LK needs to be promoted through dissemination to higher decision and policymaking levels (e.g. dissemination of LK in district and national planning meetings) and donors. Furthermore, participants identified a need for dissemination within communities themselves, seeing it as a venue for improving the informal learning process associated with LK and for tackling the intergenerational gap. Taking into account that communities rely less on their LK and are

‘unsure’ about it (Section 7.1.4 and Section 6.1.3), some interviewees pointed to a need for empowering communities to use LK, through NGOs and government promoting LK.

‘So maybe there is also a need for an element where we try to promote the use and utilisation of that LK that communities have, particularly for these communities that are not really sure whether their LK will assist them. Because the challenge sometimes is been using the LK, you still find yourself being affected every year by flooding. So they think: I think whatever I depend on, it is not working, so I need maybe to get some support.’ (NLG1)

As evident from the participants’ responses, enhancing the role of LK requires a multi-stakeholder effort. While communities are central to the process (e.g. in terms of knowledge documentation, dissemination among community members, knowledge use), NGOs and government are in a position to facilitate this enhancement. According to participants, in order to ensure sustainability, the process should be government-led, with a special emphasis on the role of local government in the districts (e.g. leading the knowledge documentation process, collating inputs from different stakeholders). The support from NGOs was also seen as important, as NGOs are in a position to be actively involved in the process (e.g. documentation of LK, validation in real time), and share their data with the government. In addition to formerly mentioned stakeholders, participants identified a role for academia (research, interdisciplinary expertise, scientific explanations of LK) and the media (e.g. dissemination).

7.4 Chapter summary

This chapter has investigated external stakeholders’ engagement with LK, by focusing on their understanding, views on and use of LK. In terms of the overall thesis argument, it was important to gather these insights as they provide understanding of how those stakeholders that are working with communities engage with LK, thus offering a piece of the puzzle to fully comprehend LK’s role. The findings presented in Section 7.1 suggest that external stakeholders are highly aware of LK existing within communities. However, they conceptualise LK as ancestral and mainly recognise the early warning component of it. This implies that the dynamic and evolving nature of LK is not acknowledged in the narratives of external stakeholders. It furthermore leaves a lot of integral dimensions of LK (Chapter 5) out of the discussion. Furthermore, external stakeholders think that LK is a topic of increasing interest and it might add value to their interventions. However, participants felt that local communities might be losing confidence in their LK, due to environmental change (i.e. climate change and environmental degradation), and penetration of new technologies.

Section 7.1 further revealed what external stakeholders see as benefits and limitations of LK. In terms of benefits, it was recognised that LK fosters acceptance of external interventions, provides insights, fosters participation and sustainability, builds trust and provides cost savings. However, despite identifying the benefits, participants put greater emphasis on the limitations of LK. Most of the limitations stemmed from the inherent characteristics of LK (e.g. lack of documentation, spatial confinement, heterogeneity), while some were due to the perceived accuracy of LK and its limited applicability for different types and magnitudes of flooding. Yet, the biggest limitation was the fact that LK has no evidence behind it, and it needs to be validated, both in terms of being time-tested in real conditions and in terms of being confirmed by established scientific methodologies. The limitations of LK were also perceived to be a significant impediment for its wider incorporation in CBFRM approaches.

In Section 7.2, the use of LK in the approaches of external stakeholders was presented. LK was found to be used both explicitly (mainly through working with VCPCs in the process of PVCAs) and implicitly (external stakeholders encouraging communities to use their LK). However, it was shown that the use of LK is limited at present, which can have negative implications. The results indicate that in the current setup, there is a preference towards approaches based on scientific knowledge.

Finally, Section 7.3 elaborated on enhancement pathways for the use of LK. According to the participants, improvements to existing community engagement is a prerequisite. Not surprisingly, the steps involved a need to document and validate LK, with a further integration with SK being heavily emphasised. However, it was challenging to draw a clear distinction between ‘validation’ and ‘integration’. Furthermore, participants thought that it is important to widely disseminate validated LK and empower communities to use it more extensively. Finally, it was emphasised that the enhancement of LK will require a multi-stakeholder effort.

Interestingly, it was noticed that there are lines of similarity between the views of external stakeholders and the views of communities presented in Chapter 6. For instance, both groups recognised the declining use of LK and intergenerational gap in knowledge possession and use, identified the same factors changing the use of LK, and explained that LK is currently not integrated to the fullest extent in CBFRM. Furthermore, they demonstrated a realistic account of LK, by both emphasising its benefits and limitations,

which were often similar between the groups. However, there were also lines of difference. For instance, the results suggest that external stakeholders fail to fully recognise the differentiated access to LK. Furthermore, external stakeholders brought up the questions of the importance of evidence of LK, an aspect that was not discussed by communities to such an extent. Therefore, it is apparent that by engaging with multiple stakeholder groups, a more realistic account of the agency of LK for FRM can be created.

This chapter presented the final results chapter of this thesis. In the following chapter, the main findings will be discussed.

Chapter 8- Discussion

As outlined in the Introduction, this thesis aimed to critically explore the role of LK in CBFMR in Malawi and identify barriers and opportunities for enhancing its role. The empirical chapters (Chapter 4-7) provided detailed accounts of the existing CBFMR system in Malawi as well as the notion of LK, including its content, use and process of production and different stakeholders' views towards it. This chapter draws together and summarises the key findings, and discusses them in the light of the existing literature. It explicitly identifies the components within the CBFMR system in Malawi that present obstacles for the use of LK and provides a range of practical recommendations for enhancing its use.

8.1 Reflection on local knowledge for flood risk management in Malawi

Chapter 5 clearly points out that communities in the Lower Shire have a complex, multi-layered and sophisticated knowledge regarding floods in their localities. This knowledge cuts across different stages of the FRM cycle, and it compromises more than 'easily' accessible technical aspects (e.g. local construction methods), and includes intangible aspects of social dynamics (e.g. the role of local governance systems and social networks).

The complexity and richness of LK identified in this thesis adds empirical evidence to the growing literature arguing that people frequently exposed to natural hazards have a great deal of knowledge that helps them to prepare for, respond to and recover from adverse effects. Different dimensions of LK identified in Malawi and presented in Chapter 5 resonate well with knowledge found in different geographical settings; for instance, with the findings of Dube and Munsaka (2018) in Zimbabwe, Fabiyi and Oloukoi (2013) in Nigeria, and Santha et al. (2014) in India. This suggests that although case-specific, LK for FRM shows similar dimensions across different spatial contexts, especially in its more technical aspects (e.g. construction methods, early warning systems), which is in line with findings from Shaw et al. (2009a).

As discussed in Chapter 7, one of the concerns of external stakeholders is the spatial confinement of LK. Indeed, the literature suggests that LK is specific to a certain locality (Warren 1991, Agrawal 1995), and this characteristic is what gives it power in development (Briggs 2005). This was acknowledged by local communities when they talked about the benefits of local EW indicators as providing them with place-specific

information (Chapter 6), and by external stakeholders when they argued that LK gives them local insights (Chapter 7). However, although the results indicate that documented LK has a place-specific character, there are no major differences between case study communities. For instance, local EW indicators, although differing across the communities (e.g. different type of trees), are based on a similar descriptive behaviours of flora and fauna species, and it was noted that people apply similar type of strategies before, during and after the floods. This can be explained by the similarities between different villages included in this study (i.e. socio-economic status, livelihoods, levels of vulnerability and exposure to floods).

The richness of LK for FRM demonstrated throughout this thesis indicates that it is a valuable resource that should serve as the foundation upon which CBFRM in Malawi is built; yet, as the accounts of communities and external stakeholders from Chapters 6 and 7 suggest, it is currently underutilised. Therefore, it is important to understand the underlying reasons for this.

8.2 The obstacles in current CBFRM for the use of local knowledge

The results from Chapter 4 suggest that CBFRM in Malawi operates under a number of challenges, both internally created and externally exposed, which effectively impede the realisation of its benefits on the ground. While a number of previous studies have identified challenges for community-based approaches (e.g. Shaw 2006, Thi My Thi et al. 2012, Van Niekerk and Coetzee 2012), these made no explicit link to how these challenges influence the use of LK. Even though the theoretical foundations see community-based approaches as a principle vehicle for LK contributions to DRR, the realities from the ground explored throughout this thesis point to a mismatch between theory and practice.

Therefore, based on the synthesis of empirical findings from Malawi, five critical components that present obstacles for LK in CBFRM are identified as:

1. Community participation practices
2. Financial constraints and capacity of NGOs and government
3. The donor landscape
4. Information consolidation and sharing
5. External stakeholders attitudes

This thesis argues that the current setup and practice of CBFRM in Malawi is not sufficiently facilitating the inclusion of LK, as evident from the first four obstacles. Furthermore, the attitudes of external stakeholders (Chapter 7) are an obstacle in itself. These arguments, based on the evidence collected, present a novel contribution of this thesis. As Carby (2015) argued, the existing focus of studies researching LK in DRR fails to consider the influences outside of the scale at which CBDRR is being implemented. However, the obstacles presented herein suggest that factors across different scales (e.g. CBFRM arrangements at village levels, local government capacity at district levels, DRR financial flows from the national level, and the donor landscape from international levels) create an environment in which the enhanced use of LK is difficult to operationalise.

8.2.1 Community participation practices

CBFRM should create a platform for local people to identify their issues, voice out their needs, and identify and lead their risk reduction efforts. Through this, it should also serve as a wheel for the inclusion of LK. However, findings from Chapter 4 show that participation, as an essential element, is not satisfactory in CBFRM in Malawi. It is currently based on the interaction of external stakeholders with VCPCs, which are an entry point for organisations and ‘the face’ of a ‘community’. Although the results from Chapter 6 indicate that VCPCs are recognised as the holders of LK and play a role in facilitating integration at local levels, there are several issues that have a direct implication on the extent of the use of LK.

First, results indicate that committees are often overlooked, marginally involved in the design and implementation of projects, and have limited power to influence the process. By inference, this indicates limited opportunities for the contributions of LK. Second, as presented in Chapter 4, there is a disconnect between VCPCs and other community members; some participants were sceptical of the extent to which VCPCs represent the views of the community at large and cascade down the benefits received (e.g. the skills acquired through training). Taking into account the heterogeneity of LK presented throughout this thesis, especially in Chapter 6, it then becomes apparent that not everyone’s LK is equally taken on board, which presents one of the main failings of current CBFRM in relation to LK. This also indicates that not everyone in the community has an equal opportunity to influence decisions regarding project activities nor to be actively involved in the process, and it is in contrast with the theoretical characterisation

of community-based approaches as a platform to enable differing vulnerabilities and capacities to be taken into account (Abarquez and Murshed 2004). Third, it was found that elderly people, recognised as the main custodians of LK, are seldom members of VCPCs, nor are they regularly consulted by the VCPCs (Chapter 5).

Furthermore, and of critical importance in relation to LK, is that village level politics influence the selection of VCPC members (Chapter 4). At times, the process is influenced by local leaders who prefer to place those close to them in the committees, further reinforcing the existing power relations. Moreover, sometimes external stakeholders base their participation approach on merely consulting the chiefs, with no involvement of other community members. Powerful individuals within a community might influence decisions to suit their interests rather than those of the greater community. The results indicate that CBFMR in Malawi is often blind to the complexity of power relations and local level politics and leads to 'elite capture', a problem that is affecting the delivery of benefits of community-based projects (Mansuri and Rao 2004, Platteau 2004). What this suggests in relation to LK is that in current CBFMR in Malawi, one must ask a question of whose knowledge counts, as it becomes apparent that the dismissal of the influence of village level politics and local level power relations creates differentiated opportunities for people to contribute with their LK in the process. Taking into account the heterogeneity of LK identified in this thesis and the fact that not everyone has equal access to LK, this becomes problematic (Chapters 5 and 6). Previous researchers of LK (e.g. Agrawal 1995, Briggs 2005) have argued that very often, both the academic and development practice remain ignorant of the relationships between power and LK, and this study adds evidence of this in relation to CBFMR. While the implications of power relations on development in Malawi (including DRR and CCA projects) have been previously researched by Penny and Nyong'o (2011), Chawawa (2018), and Kita (2019), the present study is the first evidence showing its implications for the uptake of LK in CBFMR.

A further concern is the extent of community participation in policy design, which is virtually non-existent in Malawi, and when present, is limited to discussions with few (i.e. local elites). Similar concerns of the government in Malawi being detached from the people they are representing was raised by Kita (2017a). Limited involvement in policy design indicates that people's LK fails to be considered. As shown in Chapter 4, a number of policies in Malawi see the value of LK. However, next to mere recognition, a clear

operational guidance of how this knowledge could be included is absent. As Romero Manrique et al. (2018) argue, this type of general and vague recommendations for the use of LK in policies does not result in practical knowledge inclusion during policy implementation, something that the results in this thesis also suggested.

These findings on participation caution against uncritically assuming CBDRR to be inclusive and participatory. They suggest that current CBFRM, although aspiring to ‘open the doors’ for communities, essentially does not deliver the promise of participation through community-based approaches, and consequently, the inclusion of LK. The findings from this study add to the existing literature that questions the participatory nature of CBDRR (e.g. Mercer et al. 2008, Maskrey 2011), and provide a more detailed analysis of community participation in Malawian context compared to recent studies (Kita 2017a, 2017c, Chawawa 2018).

8.2.2 Financial constraints and capacity of NGOs and government

As results from Chapter 4 suggest, the lack of a dedicated financial stream for DRR, including FRM, is an important challenge. This has direct implications on the extent of LK inclusion within CBFRM.

The lack of funding undermines the working of decentralised institutional structures in Malawi. Decentralised DRR governance is seen as a way to deliver more targeted development results and increase the participation of local communities (Djalante and Thomalla 2012, Jones et al. 2015, Grady et al. 2016), and by inference, the inclusion of LK. This process in Malawi has been delivered through the creation of decentralised institutional structures (i.e. DCPCs, ACPCs, VCPCs), as explained in Chapter 4. However, the institutional structures across different levels have no operational financial resources, and are not properly staffed or equipped. These resources constraints mean limited capacity to engage with local communities, and in the process, become exposed to LK, indicating that decentralisation ‘on paper’ does little to facilitate LK inclusion. For instance, VCPCs are community representatives in a voluntary capacity who might lack time, resources and equipment (e.g. bicycles) to engage with the wider community, thus directly creating the previously mentioned (Section 8.1.1) horizontal disconnect within VCPCs and community at large. The implications cascade at higher levels, as ACPCs lack the financial capacity to engage with VCPCs. Moreover, DCPCs, as the instrumental arm of the local government for DRR, have no operational funds, as the national

government has failed to finalise the devolution process. This makes DCPCs limited in interacting with communities in the flood-prone areas, consequently resulting in the detachment from LK. Although they acknowledge awareness of LK, in these circumstances, what they can do is limited; hence, they rely on NGOs.

However, NGOs are also not without their own funding challenges, which comes at the expense of participation and inclusion of LK. For instance, results suggest that NGOs are often constrained by finances and time given to develop their proposals. Therefore, rather than conducting extensive participatory activities for a solid baseline, which would enable project proposals based on local realities, NGOs often use secondary data from the districts (e.g. District Development Plans, District Socioeconomic Profiles), which are outdated. As participants from NGOs explained, their donors rarely fund the inception phase, where organisations would have an opportunity to come up with a comprehensive baseline of the situation. This suggests that NGOs also operate under their own institutional constraints and are especially dependent on donor-politics, as will be presented in the following section.

In addition to funding challenges, based on the results, it can be argued that NGOs, and especially the local government, also lack human capacity to engage more actively with LK. For instance, some participants from NGOs complained that they struggle to employ staff well-versed in conducting participatory activities. On the other hand, the whole of CBFRM coordination at district levels is based on a single officer from the Department of Disaster Management Affairs, while the extension workers from other departments are few in number and cover relatively large geographical areas. All of these factors have a direct implication on the extent of community participation.

8.2.3 The donor landscape

The obstacles for the inclusion of LK go well beyond local levels in Malawi. The results suggest that the existing donor landscape has a direct influence on the extent of LK use in CBFRM. For instance, participants from NGOs shared that they find it challenging to incorporate LK into their project proposals to a large extent since donors show preference towards technological and proven solutions. NGOs are dependent on donor funding and hence have to operate under their terms of reference. Interestingly, although the current DRR donor funding landscape favours phrases of ‘community’ and ‘participation’ (Titz et al. 2018), and LK is gaining relevance in global policies (UNFCCC 2015, UNDRR

2015), the results from Malawi suggest that experiences from the ground do not always reflect these landscapes and policies. This is also evident through further examples, where some participants from NGOs pointed out that projects rarely, if ever, contain a component on LK, and that donors lack flexibility, making it a challenge to incorporate local perspectives in the process.

This thesis further argues that the current donor funding landscape is not sufficiently facilitating participation of local communities, thus directly influencing the input of LK. For instance, CBFRM projects are often short-term, and participants from NGOs pointed out that donors are results-driven and want tangible results, which comes at the expense of participation, which is time and labour intensive (see also Pelling 2007, van Aalst et al. 2008). Since NGOs compete for donor funding (Jones et al. 2014), NGOs need to operate under terms that will secure them further work. What is most concerning is that the current state of community participation in CBFRM can be directly linked to what study participants refer to as ‘donor-driven’ agendas, resulting in projects that mirror the priorities of donors than actual local needs, bringing into question the extent to which community-based approaches differ from top-down approaches, adding to the claims by Heijmans (2009) and Van Niekerk et al. (2018) that community-based approaches can mirror top-down approaches, where topics of interest at local levels are externally decided. Donor agencies differ in the type of projects they finance according to their programme areas of interest (Luna 2001). Kamara et al. (2019) drew similar conclusions while researching community drought resilience in Lesotho and Swaziland, arguing that power held by donors turns local communities into passive subjects with little influence on decision-making. In Malawi, this was evident in the narratives of NGOs who stated that they ‘dance to the tunes of donors’ and local communities who complained that their inputs are not taken into account. Donors have a lot of influence in countries that rely heavily on donor funding for DRR (Jones et al. 2014).

8.2.4 Information consolidation and sharing

Delica-Willison and Gaillard (2012) argued that a multi-stakeholder approach is one of the building blocks of successful CBDRR. However, the results from Chapter 4 suggest that although CBFRM in Malawi is a multi-stakeholder effort, its coordination at district, and even national levels, is often weak, characterised by a lack of accountability and transparency, and requires improvement. In relation to LK, the implication is in the way the collected information is consolidated and shared. While both external stakeholders

and local communities raised a concern that LK is not documented, the findings suggest that a lack of coordination in current CBFRM results in a loss of already documented LK. For instance, this means that although NGOs might document some of the LK while conducting PVCAs, this information will not find its way to local government, since NGOs were heavily criticised (Chapter 4) for not sharing reports with local government and failing to be accountable to the local government. Thus, the local government will not be in the position to create a repertoire of documented LK, despite identifying a need to do so.

Similarly, the decentralised institutional structure should facilitate a process where priorities and inputs from the grassroots (i.e. GVHs) inform the planning at the higher levels (i.e. districts). This remains a challenge in the existing setup. For instance, participants mentioned that what was developed in the Village Contingency Plans will be consolidated into the Area Contingency Plans which will further feed into the District Contingency Plan. However, the review of the Contingency Plans in Chikwawa and Nsanje revealed that, for instance, local indicators are not considered in the district documents. In Chikwawa, the reference to LK is a mention of a single indicator (frogs flocking into the communities), seeing local communities as sources of early warning information, and acknowledging drum beating and whistle blowing as local methods for warning dissemination (Chikwawa District Council 2014). In Nsanje, LK is referred to only with regard to the fact that the local indicators need to be documented (Nsanje District Council 2015). In neither of the documents was LK referred to in any other of its dimensions.

8.2.5 External stakeholders' attitudes

In addition to the previous four obstacles, which can be assigned to the current practice of CBFRM in Malawi, the results suggest that the attitude of external stakeholders also presents an obstacle for the inclusion of LK. Whilst participants argue that LK is increasingly being seen as important and genuinely appear to recognise LK as potentially useful, little is revealed of how this importance is translated to practical application of LK, and a number of challenges for its use have been identified (Chapter 7). Most of these challenges stemmed from the very nature of LK (e.g. not being documented, being spatially confined). As a common theme, participants asked for LK to be documented and validated before they can make further use of it. This indicates that despite the general appreciation of LK, external stakeholders see the agency of LK only when it fits into their

frames of understanding and worldviews, which presents a significant finding of this study. Dekens (2007) drew attention to the fact that it is popular to use LK in discourse, since it is connected with the internationally acceptable rhetoric of participation, whereas the experiences from the ground might tell differently. Results from Malawi suggest the same: rhetoric appreciation of LK does not lead to LK being an equal component in the design of FRM interventions at local levels.

The constant calls for generating evidence for LK through scientific validation described in Chapter 7 reveal another important aspect of external stakeholders' attitudes: the dichotomy between LK and SK is still very much present on the ground, despite academic research demonstrating this to be unhelpful (Agrawal 1995, Berkes 2009). This is important because it clearly shows that the differential power relations between the knowledge of local people and external stakeholders is maintained, and indicate that CBFMR, an approach that is supposedly built on LK and participation, has done little to challenge this attitude, but has rather 'masked' this dichotomy behind the rhetoric of participation and community-based interventions. This statement is not to dismiss aspects in which LK is involved (e.g. PVCAs, awareness raising campaigns, outlined in Chapter 7, Section 7.2). However, the results show that this is limited at the moment, and external stakeholders themselves acknowledge there is a long way to go in creating a system in which these knowledges will be used side by side and with equal weight.

If the way for LK to prove its value for FRM is for it to be validated by scientific methods, then it is clear that the existing system is built on the premise of the dominance of SK, where LK can only possibly complement it, but only after its agency has been proven. Additionally, as the results from Chapter 7 suggest, one of the biggest benefits of LK is that it can foster application of their (i.e. external) interventions. While exploring the approaches to community participation in global DRR policies, Tozier de la Poterie and Baudoin (2015) found that global policies increasingly see LK as a way to tailor different external interventions to the audience, rather than seeing the value of LK in DRR *per se*. The results suggest that the reality from the ground mirrors this global outlook.

The discussion on the dichotomies between SK and LK is especially evident in the narratives surrounding local EW indicators. These attitudes significantly influence the extent to which LK is currently included in FRM, since participants emphasise that it is difficult for them to use LK in the absence of proof of its effectiveness. Interestingly,

although external stakeholders recognised that communities are in the best position to provide information about flooding in their localities (Section 7.1.2), it seems that communities' accounts of how LK has been assisting them does not present sufficient evidence for external stakeholders.

Furthermore, the answers from external stakeholders presented in Chapter 7 suggest that they disregard the dynamic nature of LK and the fact that it constantly evolves. This possibly adds to the perception of LK as inferior since it fails to account for the fact that LK is not simply 'knowledge of the parents', as it was often depicted, but rather that local people constantly adapt their approaches by incorporating new learnings and adding new layers of experience.

As results suggest, a mere recognition of LK by external stakeholders does not translate into its meaningful inclusion, which is in line with Cook's (2015) findings from Bangladesh. However, this study provides additional evidence revealing how the dichotomy between local and scientific knowledge is maintained at local levels and how this directly influences the use of LK in CBFRM. The findings on this dichotomy present a valuable addition to studies on the integration between local and scientific knowledge (e.g. Mercer et al. 2010, Hiwasaki et al. 2014a, Carby 2015), by interpreting the attitudes of external stakeholders in the process.

Section 8.2 revealed how the current practice of CBFRM in Malawi shapes the position of LK. The findings of this research yielded further useful understanding of the notion of LK, especially its process perspectives, which, according to Briggs (2005) are a way forward in providing a platform for LK in development (and DRR). In line with this, process perspectives also offer valuable lessons for LK interaction with current CBFRM, and will be elaborated in the following section.

8.3 Process perspectives of local knowledge

Findings from Chapters 5 and 6 show that LK is produced through people's continuous exposure to flooding and lived experience of recurrent and extreme floods. People observe their environments to anticipate flooding and develop a number of strategies that help them with lessening negative impacts. The production of LK is a highly dynamic process, as evidenced by people's narratives on how they incorporate learnings (including those coming through CBFRM and increased exposure to external interventions and

technologies) and develop new layers of understanding (e.g. through extreme events and the reported changing nature of flooding) thus adjusting their LK. Moreover, people are continuously time-testing their LK, deciding what works for them and is effective (e.g. temporary relocation to shelters) and what is becoming obsolete (e.g. increasing lack of certainty of local indicators). Tested against repeated flooding, their knowledge evolves and is refined. These findings imply that people living in flood-prone areas, experiencing frequent flooding, are active learners and experimentalists, constantly seeking innovative ways to locally manage floods. Therefore, it is critical to recognise them as such and support them in developing their LK, as opposed to depicting them as passive recipients of aid.

The crucial finding regarding the knowledge production process is the extent of influence of external interventions on LK creation, including CBFRM, a perspective identified both by communities and external stakeholders. As recognised by all stakeholders, external interventions can reduce the reliance on and use of LK. However, as the results suggest, this is a partial view. This thesis shows that it is almost naïve to think of LK as being somehow resistant to external influences, including scientific knowledge, a thought already well echoed in anthropology and development studies (Sillitoe 1998b, 2000, Briggs and Sharp 2004, Briggs 2013), but not sufficiently emphasised in disaster risk literature. While Hooli (2016) talks about the simultaneous use of LK and external knowledge in FRM in Namibia, evidence from Malawi points to more of an integrated use, where people constantly appropriate, internalise and integrate externally introduced knowledge in their practices (Table 6.2 in Chapter 6). There is a thin and blurred line between the different knowledge types, which is resulting in new forms of hybridised knowledge utilised by local people. This was especially evident in the concept of informal triangulation and integration (Chapters 5 and 6), where people use multiple sources of information (e.g. local indicators and official warnings) to assess the situation and make a decision. This triangulation and integration is informally and spontaneously happening on the ground, at individual levels, which is line with recent findings from India (Acharya and Prakash 2019) and the Philippines (Ton et al. 2017, Balay-As et al. 2018). This study adds to these findings by showing that integration also happens at community levels, through engagement of VCPCs in the process of participatory scenario planning and the development of village contingency plans. Findings on integration from Malawi suggest that it is already happening on the ground, on individual, household and community levels, while the majority of the literature is focused on emphasising the need for

integration (Mercer et al. 2010, Dube and Munsaka 2018). Therefore, attention in CBFRM work should be put on how to support people in the communities in this integration process, and extract lessons from existing integration processes on the ground.

Findings also suggests that, when experiencing a flooding problem, people opt to integrate and use what is available to them, which is in line with suggestions from Briggs (2005) that people are ultimately pragmatic. First, people will test new knowledge, and if effective and affordable to them, opt to integrate it into their approaches. Naess (2013) reached similar conclusions in Tanzania. This might mean that some knowledge is left behind, but it is not necessarily a negative thing, as new knowledge is being created. As the results suggest, especially in Chapters 6 and 7, presently the integration process in Malawi is highly unstructured and informal, at individual and household level as well as at the interface between local communities and external stakeholders. Results from Chapter 7 also suggest that integration within CBFRM between LK and scientific knowledge is seen more as something to be developed in the future rather than currently widely implemented. This resembles the experiences from the Philippines, where LK integration is not formally considered at decision making levels (Molina and Neef 2016). But it also suggests another aspect: that current CBFRM in Malawi misses an opportunity to learn from the informal integration processes. A mere implicit use of LK, through its ‘encouragement’ (Section 7.2.2) is not sufficient in fostering the means for integration.

Different people have different knowledge, a crucial aspect to consider when thinking about LK contributions to DRR, and when engaging with LK in community-based approaches. For instance, farmers have different knowledge to fisherman who are more closely connected to the river and thus in a position to monitor changes, as shown in Chapter 5. Elderly people were identified as the main holders of LK for FRM in Malawi, and, together with chiefs present what Berkes (2009, p.153) refers to as ‘*institutions of knowledge*’. However, the most interesting insight in the light of interaction between LK and CBFRM is that VCPCs were also seen as important holders of LK. This indicates that in a setting like Malawi, where external institutions (i.e. NGOs and local government) establish local disaster committees with a designated responsibility to manage all DRR matters in their community, they have a direct influence on the process of LK. On the positive side, this can mean that people get additional knowledge, thus giving them more opportunity to integrate and choose what works best for them. Furthermore, it can give greater prominence to the existing knowledge dissemination practices, as evidenced in

this research. However, it also has a potential for negative effects: as previously discussed, there is a degree of village level politics and power relations attached to VCPCs in Malawi. Hence, this can exacerbate power inequalities within a community by giving more knowledge (and opportunity to integrate) to some while leaving others behind.

This section discussed the findings in relation to process perspectives on LK, and provided especially interesting insights on how LK interacts with CBFRM. Yet, the empirical accounts from both communities and external stakeholders in Chapters 6 and 7 also reveal a need for a critical outlook on LK, omission of which risks placing unreasonable claims on the potential of LK in DRR, as well as taking an approach to mobilising LK detached from its reality, thus resulting in limited benefits of its inclusion. Therefore, this is discussed in the following section.

8.4 The critical outlook on local knowledge

In their recent study from Zimbabwe and Bangladesh, Dube and Munsaka (2018) and Haque (2019), respectively, documented different dimensions of LK and argued that because people have LK they are able to take care of themselves. Similarly, Chawawa (2018, p.130), while researching self-perceived vulnerability to floods in Malawi argues that in some cases *‘the smallholder farmers also have local knowledge on the flood management hence are confident to face the floods’*. Findings from the present research suggest that this reasoning is incomplete, as it approaches LK uncritically. As found, people do have rich LK and it assists them to a certain point; however, as it will be discussed through this section, there are several empirically grounded reasons for a more critical outlook.

8.4.1 Socio-economic and political dimensions of local knowledge

The results of this research reveal that LK and its use have both socio-economic and political dimensions, and these aspects need to be carefully considered in external approaches as they determine people’s access to and use of LK. As the results suggest, these aspects are not sufficiently considered in CBFRM in Malawi. Although found locally, different components of LK are not equally accessible to all; rather, they are conditioned by access to resources (e.g. community members who cannot store food in anticipation of floods, lack access to land for early evacuation or financial capacity to build stronger houses), and position within society (e.g. being a VCPC member, differences in age and education). Both Dekens (2007) and Mercer (2012) emphasise that the fact that people have knowledge does not mean they can access it and use it, since

they might simply not have the resources to do so. The results from Chapter 5 and Chapter 6 add evidence to this proposition. Furthermore, not everyone has the same access to triangulation and integration of external knowledge, as this is influenced by their exposure to new technologies and methods through trainings and interaction with external stakeholders, as well as by their financial capacity to afford aspects of ‘new’ approaches (e.g. owning a radio). As shown in Chapter 6, this also reveals a political dimension of LK, since, as previously mentioned, being a part of the group that receives training (e.g. VCPC) is influenced by village level politics and power relations. In the realm of anthropology, Pottier (2003) argues that LK cannot be discussed without engaging with its social, economic and political dimensions, and this thesis points to the same. An approach based on simply portraying LK for FRM as being available within a community is ignorant of the realities and complexities of LK.

8.4.2 Diversity of views on local knowledge

The findings from this study suggest that people have diverse views on their LK, which is another line of evidence emphasising the heterogeneity of LK within a community. This cautions against simply portraying LK as a unitary body of knowledge within communities, something that the current development agenda, focused on the generalisation and ‘up-scaling’ of LK, is often doing (Smith 2011, Briggs 2013). For instance, it was found that an intergenerational gap in knowledge use is significant, and while younger generations prefer technology, elderly people prefer to stick to LK and might be reluctant towards the unknown. Overall, findings from Chapter 6 suggest that there is an ‘aura’ of uncertainty regarding LK and people see its decreasing importance, use it less and feel ‘unsure’ about it, findings very important for the debate on LK in Malawi. The findings also suggest that external stakeholders contribute to this decreasing reliance, as their scepticism towards LK might undermine people’s reliance on their LK, as they might feel that when they are doing is not ‘good enough’ and ‘backwards’. This reveals an interesting aspect of CBFRM’s influence on LK, and suggests a need for a more open dialogue and better mutual understanding between external stakeholders and communities. Furthermore, it is interesting to notice that while external stakeholders strongly argue for an increased interest for LK, knowledge holders themselves report decreasing reliance.

8.4.3 External pressures on local knowledge

People’s views on LK are shaped by their experiences. They reported the changing nature of flooding making their LK less reliable than previously thought. Similar concerns were

raised in the interviews with external stakeholders. Communities also reported limited effectiveness of LK, especially in relation to extreme events and floods initiated by the rainfall in the uplands. As identified by communities and external stakeholders, these changes are connected with larger processes such as environmental degradation, climate change, private interests and population growth which leads people to settle in marginalised and flood prone areas. Therefore, all of these need to be accounted for when considering LK and its utility for FRM. For instance, participants saw the manifestation of climate change as a change in rainfall patterns, which negatively influenced the reliability of local EW indicators. These findings are in line with previous research in different geographical regions (Kagunyu et al. 2016, Ton et al. 2017, Ngwese et al. 2018, Balay-As et al. 2018), and oppose findings by Boillat and Berkes (2013) who suggest that the way in which people in Bolivia observe their LK is not affected by climate change. Similarly, participants also emphasised that the increasing magnitude and frequency of flood events means that LK is not as useful in reducing flood impacts as it once was. Taking into account that the frequency and intensity of extreme events is projected to increase in the region (Chidanti-Malunga 2011), it becomes apparent that LK needs to be looked at objectively, fully understanding the limitations it has in the light of climate change, since the knowledge holders expressed the limitations in light of extreme events. At the same time, one of the main characteristics of LK is its adaptability, and whilst climate change will render some LK irrelevant, other LK will adapt and/or emerge as local communities adjust their approaches under the conditions of climate variability (Flavier et al. 1995). Yet, an interesting aspect for further investigation would be to understand the adaptation limits of LK under the changing climate, as previous research identified that adaptation of social systems to climate change has its limitations (Dow et al. 2013).

8.4.4 Local knowledge and underlying causes of vulnerability

Climate change and environmental degradation directly influence the use and applicability of LK, yet people in the Lower Shire Valley have no direct influence on deforestation rates in the Middle and Upper Shire Basin nor on reversing the impacts of climate change. Similarly, they do not have influence on dictating where development initiatives are taking place, since this is part of the decision-making processes led by government or donors from which they are excluded, as was shown in Chapter 4. The decisions about them, made without them, directly influence the use and importance of their LK (e.g. whether the VCPC will be formed in the village, whether they will get the

opportunity to appropriate external knowledge in their local approaches through integration, whether they will be exposed to new technologies). Furthermore, as evident through a discussion on access to LK, access can be directly related to poverty. Yet again, local people have limited power in shaping and influencing the processes that create impoverishment.

Thus, it is reasonable to infer that LK is influenced by processes and agendas that stem from outside the communities' imminent locations and influence, and that generate vulnerabilities in the first place. Rather than uncritically labelling local communities as resilient, efforts should be placed at tackling underlying causes of vulnerabilities, which the existing CBFRM in Malawi is not doing sufficiently. As Maskrey (2011) noted, a focus on the purely technical aspects of risk management, also noted in Malawi (Chapter 4) can yield quick benefits but without engaging with the underlying causes of vulnerability, such as land tenure. In Malawi, no evidence was found of current CBFRM dealing with this issue. Moreover, there was no evidence of CBFRM challenging the distribution of power, wealth and resources, factors listed as root causes of vulnerability (Wisner et al. 2012). Paradoxically, while trying to empower and make communities active players, the findings suggest that the failure to account for village politics and power relations can make those in power even more powerful, while further silencing the voices of the others. Furthermore, a lack of community involvement in policy making and limited influence on the agendas of implementing parties indicates that CBFRM creates very limited opportunities for local people to influence processes outside their localities.

Therefore, assigning resiliency to vulnerable communities simply because they possess LK can shift the attention away from the social, economic and political inequalities that limit people's capacity to deal with flooding, including their ability to apply different aspects of LK. This is an important finding for Malawi, but also internationally, since LK is receiving increasing attention. Results show that LK does bring benefits to communities affected by flooding, but these benefits have limitations, as the underlying causes of flooding and generators of vulnerabilities are beyond their control. These findings add to the global literature on the topic of LK and are in line with recent research by Hooli (2016) in Namibia, Islam et al. (2018) in Bangladesh, and Hilhorst et al. (2015) in Thailand and the Philippines.

8.5 Power relations in community-based flood risk management

As empirical findings from the present research indicate, an important component of CBFRM in Malawi and the role LK plays within it are power relations between different stakeholder groups, institutions and layers of decentralised governance system in the country. First, as discussion in Section 8.2.1 and empirical data from Chapter 5 point out, power relations at community level explicitly influence who is involved in CBFRM projects (through membership of VCPCs and the role of chiefs) and who benefits from CBFRM projects. As a direct consequence, power relations determine whose LK and priorities are included. This sends a strong message that if CBFRM in the country is to tackle the underlying causes of vulnerability and really serve as a platform for building onto differentiated capacities, it needs to put much more effort into understanding community-level power relations and devise creative ways in which these could be mediated.

Second, different stakeholder groups interacted with in this research hold and exhibit different power over other groups. For instance, as government is largely not able to deliver CBFRM on the ground, it is reliant on NGOs, which leads to a situation where government has limited say over the action of NGOs. As a result, issues directly influencing the success of CBFRM arise, e.g. NGOs not sharing project information with the government making it difficult for government to deliver its mandate of coordinating all CBFRM activities. Furthermore, the government holds power in deciding whom to involve in decision making, including policy development. At the moment, this is largely exclusive of local communities, raising questions of the origins of community involvement in CBFRM (e.g. is CBFRM something that is simply implemented at community levels rather than originating from actual community needs and priorities?). What these examples indicate is that when framing CBFRM as a multi-stakeholder process, one needs to consider differences in power held by different stakeholders, as this can increase understanding of why CBFRM might lack the sustainability and effectiveness it aims for. Finally, in terms of different stakeholder groups, the power of donors cannot be overlooked, as indicated in Section 8.2.3. As results show, donors have a lot of power in determining the very course of CBFRM and what it entails, as CBFRM often mirrors priorities of donors rather than local needs.

Third, power relations are evident across different institutions constituting the decentralised disaster governance system in the country. At the national level, the work

of DoDMA, as the main governmental body in charge of DRR, is constrained by national government that has a power to devolve DoDMA's functions (but has failed to do so), thus providing it with an operational fund that would assist its work. This has direct implications for the work of DoDMA's officers at district levels, which are currently hosted by a different government department. Furthermore, in the current system, as policy making is centralised at national level, local governments have limited power in influencing the process. This indicates that although local governments are closest to people on the ground, they are limited in the extent to which they can inform the national level policies. Moreover, the prime example of differentiated power across decentralised disaster governance in Malawi are relations between different levels of decentralised institutional structures (i.e. DCPCs, ACPCs, and VCPCs). As results from Chapter 5 indicate, VCPCs have limited power in influencing higher levels, although the decentralised system is theoretically supposed to facilitate this type of 'upward' communication. As a result, VCPCs are left 'clueless' of what is happening with their inputs, as the identified lack of accountability from district-level government towards communities shows. The findings on differentiated power relations in institutional DRR settings in Malawi provide a learning that decentralisation on paper does little in enabling different institutional layers to be equal players in the process of planning and delivering CBFRM.

Finally, and more specific to LK, the results indicate another aspect of power relations, evident in the maintenance of power of external/scientific/Western knowledge over LK. As results from Chapter 7 indicate, external stakeholders clearly show a preference towards external knowledge, manifested through their narratives that LK needs to be scientifically proven and validated. As they hold more power than local communities (i.e. LK holders) in current CBFRM, it can be inferred that they can act as gatekeepers to enhanced inclusion of LK, thus limiting its potential contribution, as discussed in Section 8.2.5.

The discussion presented herein on power relations across different stakeholder groups, institutions, and layers of decentralised governance presented throughout this section indicates that power relations are an important determinant of CBFRM in the country. As such, they need to be accounted for when assessing the current setup and practice of CBFRM.

8.6 Towards the enhanced use of local knowledge for community-based flood risk management in Malawi

Thus far, Chapter 8 has provided a critical discussion on the concept of LK and identified obstacles in existing CBFRM, going on to elaborate on how these shape a complex environment in which LK is not adequately utilised. However, in order to reach the overall aim of this thesis, it is required to discuss the opportunities for the enhanced use of LK. Therefore, this section focuses on practical recommendations for enhancing the role of LK in CBFRM in Malawi. The recommendations were developed based on the accounts of participants engaged through this research (especially in Section 8.5.2), the existing literature, and the researcher's interpretation of the collected data.

8.6.1 Recommendations for improving the current approaches

8.6.1.1 Changes to participation practice

While in Chapter 4 it was identified that community participation in current CBFRM is limited, Section 8.2.1 discussed its direct impact on the use of LK within CBFRM. Therefore, it is much needed to improve the existing participation practice, as it would create a more facilitating environment for LK. It would also contribute to the higher impact of CBFRM in Malawi, as previous research shows that community participation in design and implementation of projects increases the project performance and impacts (Sherman and Ford 2014).

The existence of VCPCs and their involvement in CBFRM presents an opportunity for the enhanced use of LK, as it creates an institutional structure through which external stakeholders interact with local communities. However, in order to improve the practice, some changes are needed. First, in order to tackle the challenges of village level politics, there is a need to ensure more transparency in the selection of VCPCs, as it was shown that the current membership often implies the inclusion of those with more power and is influenced by local chiefs. Therefore, external stakeholders working with communities in Malawi should account for these power relations and design a membership selection process in a manner that will be inclusive of all community groups, since as argued by Mercer et al. (2008), community participation exclusive of consideration of power dynamics at local levels is inadequate. This would also require strengthening of the institutional capacity of external stakeholders, especially in terms of facilitation of a participatory process, as low institutional capacity was recognised to hinder community

engagement (Sherman and Ford 2014). Hence, it would require more human and financial resources from NGOs and local government.

Second, since in the current system the members of the VCPCs have individual responsibilities (e.g. a person tasked with taking the readings from the installed water level gauges), a specific person should be appointed for LK. Their specific role could be to document what LK is available, what is observed in a given year, and to share these findings with the rest of the VCPC members, in order to facilitate a contribution from LK to village-level planning (e.g. contingency planning). Furthermore, since it was reported that elderly community members, as main knowledge holders, are often not VCPC members, this research recommends inclusion of this demographic, as it would create a direct link between the main knowledge holders and CBFMR.

Third, there is a need for enabling enhanced interaction between VCPCs and the wider community, as a platform for allowing for the knowledge of different people to be shared and accounted for. For instance, this could be done by organising monthly meetings with the rest of a community, as opposed to meetings organised sporadically. Also, VCPC members should use any other opportunity to interact with the community they represent (e.g. during other community meetings such as religious ceremonies, or meetings of women and youth groups). The importance of interacting with the wider community needs to be a core component of the VCPC training, through which interaction and the importance of LK should be emphasised. Furthermore, interaction can be fostered by increasing the number of VCPC members. At the moment, it is up to 15 individuals coming from different villages of the GVH, which are composed of several villages.

Although these recommendations would provide more space for LK, it is important to be realistic. As shown in Chapter 4, in the current system, it is difficult to sustain VCPCs beyond a timeframe of a specific project. Moreover, they are engaged in a voluntary capacity. Therefore, in CBFMR overall, it is important to consider how to enhance the effectiveness of VCPCs and ensure their continuous engagement.

Finally, there is a need to involve communities in decision making processes at higher levels, including policy making. This could be achieved by involving ACPC and VCPC members in the DCPC meetings at district levels. More importantly, it would require decentralisation of the policy-making process from the national scale, and giving more

power in this process to local governments. As shown in Chapter 4, the policy making in the current system is centralised.

8.6.1.2 Enhancing information sharing, consolidation and coordination

Improvement in existing information sharing and coordination between different stakeholders involved in CBFRM could greatly contribute to the enhanced role of LK, as it would allow for the increased visibility of LK captured at local levels through various initiatives (e.g. VCPCs developing Village Contingency Plans, NGOs conducting PVCAs). This can be delivered both through improving the way in which information is shared through the decentralised institutional structure for DRR, as well as through increased accountability of NGOs towards the local government.

For instance, it was found that LK captured at the GVH level is not incorporated in the district level documents, such as contingency plans (Section 8.2.4). This can be associated with the current practice of the development of contingency plans presented in Chapter 4. At the moment, ACPCs are in charge of consolidation of information collected at GVH level; however, the results suggest that this process is inefficient. Furthermore, consolidation at the TA level might result in a loss of valuable localised information. As evidenced in Chapters 6 and 7, LK provides very valuable spatially-bound information. Therefore, a recommendation is made to share all the collected information (e.g. PVCAs from specific locations) at the district level, where this information could be consolidated by DoDMA officers with help from DCPC members and serve as a direct input to District Contingency Plans and District Disaster Risk Management Plans²⁹. This process could facilitate the creation of a LK repository at district levels, thus making this knowledge more accessible to external stakeholders, who identified (Chapter 7) its accessibility as one of the obstacles to the application of LK in their approaches. This type of approach would put an additional burden on a local government, which is, as the results of this research showed, under-resourced and under-staffed. Therefore, a requirement is to increase support to the local government from the national level, as it will be discussed in the following section.

Moreover, in order to capitalise on the presence of NGOs in the field, it is of utmost importance that NGOs share their project reports and information collected with the local

²⁹ As explained in Chapter 4, these plans were not created at the time of the data collection for this study, due to financial difficulties. However, these plans are envisioned by the national policies.

government, which is not current practice. This would require NGOs to be more accountable to district governments, and could be facilitated by making an explicit request by the government to a respective NGO once when the NGO comes to the District Council to ask for permission to start a project (explained in Chapter 4).

8.6.1.3 *Changes to funding landscape*

In order to open additional avenues for the enhancement of LK, there is a need for changes to the funding landscape. Taking into account that, globally, DRR is increasingly being seen as a local issue, emphasising that local governments are in the best position to engage with their constituents on issues of DRR (UNDRR 2010) it is important to appropriately support them with adequate funding (Jackson 2011). As results from Chapter 4 indicate, limited funding effectively stifles the activities of local government in Malawi, including their engagement with local communities, and by inference, LK. Therefore, a primary recommendation is to form a dedicated DRR funding source for the local governments, especially for the work of DoDMA officers at district levels and DCPCs, which are currently not funded. The creation of a dedicated operational fund at district level would allow government officials to interact more with communities, and in the process, engage more with LK. Many participants in this research, both from the governments and NGOs, drew attention to the need for such funding. Although, as presented in Section 4.1, the government is working on such an initiative, the delivery has been slow. In addition to funding at the district level, there is a need for creating a funding system through which decentralised institutional structures for DRR at lower administrative levels (i.e. ACPCs, VCPCs) would be supported in their work.

Furthermore, the results suggest a need for a change in the donor funding landscape. The funding should be tailored towards longer-term projects (e.g. five years) and should include funded inception phases, where it would be possible for NGOs to conduct timely and extensive baselines, based on participatory activities, thus designing projects based on local insights and respective of LK. These aspects were identified as success factors by external stakeholders, and a change in funding arrangements could facilitate better representation of local priorities, thus contributing to overcoming the issue of project sustainability. Furthermore, in order to gain more insight into LK and raise its profile, it is recommended to fund projects (or integrate as a part of the project) that would explicitly focus on the exploration and employment of LK.

Overall, as results suggest, people in the Lower Shire Valley have a lot of LK, and in many instances, know what to do. However, as discussion in Section 8.2 suggests, often they do not have resources to act on it. Therefore, CBFRM interventions should focus on maximising this LK and provide resources to communities that would allow them to employ their LK for mitigation, preparedness and early action. However, this would require systemic change across spatial and institutional scales, especially in terms of how funding is allocated and what activities are prioritised.

8.6.2 *Building evidence for LK as a tool for changing the attitudes*

As results indicate, one of the obstacles for the increased use of LK is attitudes, predominantly those of external stakeholders. However, it was also noticed that certain sections of communities, especially younger generations, expressed decreased reliance on LK. Overall, there were doubts about the reliability and effectiveness of LK. These result in scepticism towards LK, which directly influences the extent of its use, by various stakeholders. Therefore, increasing confidence in LK is required, which can be done through building evidence for its effectiveness. A simple procedure is recommended in Figure 8.1.

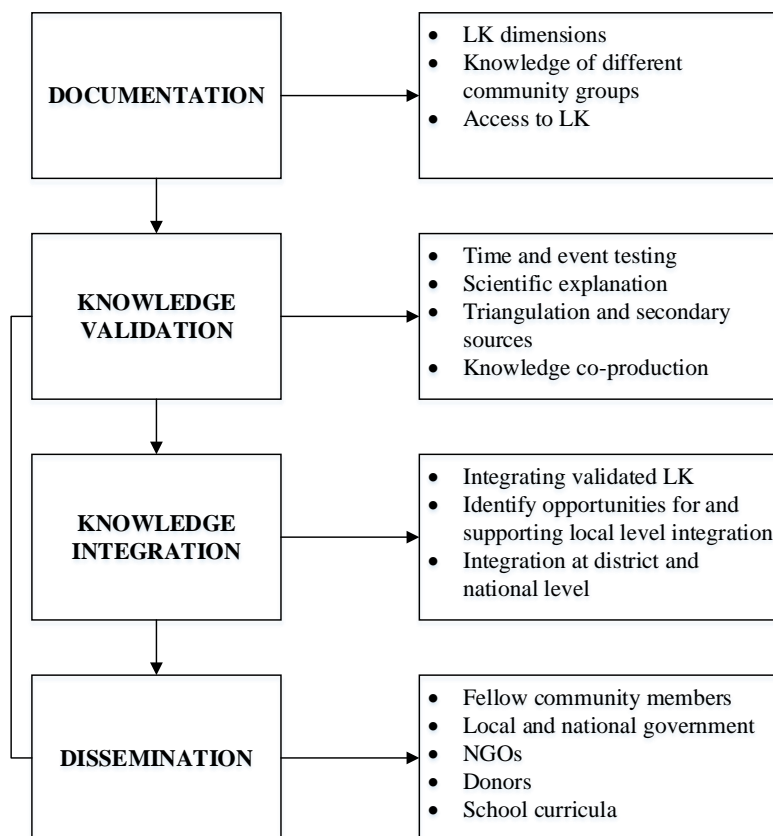


Figure 8.1 Recommended steps for building evidence for local knowledge

Proving the effectiveness of LK is seen as an important step if LK is to be further applied in DRR policy and practice, since the existing evidence on its effectiveness is limited (Dekens 2007, Mavhura et al. 2013). This necessarily involves some knowledge validation, although this is seen as controversial by some authors (Gratani et al. 2011, Matsui 2015), with an explanation that validation of LK by using scientific methodologies perpetuates power disparities between different knowledge systems. However, while discussing LK under the realm of DRR, Twigg (2015, p.148) argues that

'Local knowledge, skills and coping capacities must be assessed rationally and scientifically on the basis of their effectiveness. This is not a debate between local/indigenous/traditional and external/scientific/modern systems in themselves, but a question of finding the most appropriate approach for each situation.'

The findings from this research support Twigg's point, arguing that this is a necessary step if LK is to make a larger contribution to CBFRM, both within communities as well as in external approaches. The importance of proving effectiveness is especially important in the light of the findings indicating how LK is pressured by various external processes, such as climate change and environmental degradation. This research argues that building evidence is a tool that could ultimately lead to challenging some of the attitudes expressed by participants of this research. For instance, it can help with tackling the intergenerational gap, as younger generations gain more confidence. Furthermore, previous research indicates that communities, frequently exposed to and affected by natural hazards, can also lose trust in their LK (Wisner et al. 2004). Therefore, building evidence and widely disseminating it can potentially lead to increased application of LK. Finally, if presented with evidence that LK works, external stakeholders could increasingly apply it in their approaches and overcome their scepticism.

8.6.2.1 Documentation

Documenting LK is a first step towards overcoming the limitation of LK identified both by communities and external stakeholders (Chapter 6 and Chapter 7). For instance, it could facilitate easier access to LK for NGOs and government bodies implementing CBFRM projects. Through documentation, a repository of LK at community level could be created, which could further feed into the district level documents. The different dimensions of LK identified in Chapter 5 (Figure 5.1) could serve as a blueprint for documentation process.

Since the involvement of knowledge holders is of extreme importance in knowledge documentation (Green et al. 2010), the process of documentation in Malawi needs to be community-led. Taking into account the existing institutional setup for DRR, VCPCs should be instrumental (also considering the recommendations for the setup of VCPCs presented in Section 8.6.1.1). People would be more confident in sharing the knowledge they have with their fellow community members, and a community-led nature of the process could contribute to sustainability of the approach.

Taking into account the diversity of LK within a community, it is important to document the knowledge of different community groups (e.g. LK held by women, men, elderly, younger generations). Furthermore, documenting should have an aspect of mapping whether people have access to a specific type of LK (e.g. access to canoes for evacuation, land for early evacuation and temporary relocation, food reserves), in order to create a more realistic representation of what knowledge can be applied by whom. Previous advice on LK documentation in DRR (Hiwasaki et al. 2014a), has not taken into account the diversity of knowledge possession and access to it, thus ignoring aspects which this research shows are critical elements to consider.

Although community-led, external stakeholders should support the process within their programmes. For instance, the support could be in the form of developing materials for documentation, training VCPCs in data collection and storing, and providing materials (e.g. notebooks). These stakeholders should also ensure that the documentation collected at community level is shared with the local government, in order to feed into a district-wide repository of LK. In order to overcome the deficiency of inadequate documentation management at district level, identified in this research, it is advised to digitise documented LK.

Moreover, throughout data collection, it became evident that in some instances different communities use different names for the same indicator (e.g. frogs are called '*chule*', '*lumbu*', '*tchonga*'). Furthermore, it was not possible always to translate the local name to English. These factors show that documentation of LK is a complex process that requires an interdisciplinary team of specialists (e.g. botanists, zoologists, engineers, biologists, social and physical scientists, linguists) working with local people.

8.6.2.2 *Knowledge validation*

Documented LK would be a basis for validation, a crucial aspect in changing attitudes, as it would provide much needed evidence on whether LK is effective or not. In line with recommendations given by participants of this research and building on experiences of researchers from Jamaica (Carby 2015), Zimbabwe (Bright et al. 2014), and the Philippines, Indonesia and Timor-Leste (Hiwasaki et al. 2014a), the following approaches to validation are proposed:

- **Time/event testing:** making a record of how LK ‘performed’ under certain conditions. For instance, this can include monitoring the documented local EW indicators and seeing whether what was indicated translates into an actual occurrence on the ground. Similarly, it can include monitoring to what extent local structural practices prove robust against different levels of flooding. The monitoring can be done by the members of VCPCs in collaboration with the wider community.
- **Scientific explanation:** since external stakeholders overwhelmingly ask for a scientific explanation of LK (Chapter 7), an interdisciplinary team of scientists (e.g. academics from Malawian universities, including social and physical scientists, and engineers) could discuss LK and see whether there is any scientific grounding. This process needs to include knowledge holders themselves. Experiences of Hiwasaki et al. (2014b) from the Philippines and Balehegn et al. (2019) in Ethiopia show that many of the local EW indicators have scientific explanations. Besides EW indicators, this can also include, for instance, verifying people’s knowledge of flood hazard with hydrodynamic modelling, explanation of people’s approaches to local construction, and societal relevance of social networks. The results of this scientific analysis of LK should be shared back to community members, since it can assist in enhancing communities’ understanding of scientific explanations of their LK (Hiwasaki et al. 2014a). It could also increase community confidence in their LK, since they (e.g. younger generations) could see that some of their approaches have scientific grounding. For instance, research conducted by Gratani et al. (2011) with indigenous people in Australia showed that people found the validation process empowering since it allows for their knowledge to be appreciated by scientists. However, it is important to acknowledge that there are different ways of knowing, based on differing epistemologies (Mistry and Berardi 2016), that were briefly discussed in Section

2.4.4. Therefore, in the case that no scientific explanation is available, knowledge should not be disregarded, as any decision about LK can be made only by knowledge holders themselves (Balehegn et al. 2019). This is in strong opposition with Chiotha et al. (2011), who, while finding scientific explanation for several EW indicators in Malawi argued that those that have no scientific explanation should be simply disregarded, since these are ‘*not good enough*’ (Chiotha et al. 2011, p.6). Dismissal of LK on the basis of its content not fitting scientific understanding only puts local people in a marginalised position while maintaining the supremacy of one knowledge system (Mistry and Berardi 2016, Roue and Nakashima 2018).

- **Triangulation and secondary sources:** Carby (2015) recommends the use of multiple sources from within a community or neighbouring communities, and to correlate LK reported by communities with existing reports or previously reported flood events. Similarly, since it was noticed in Malawi that different communities have similar categories of LK, triangulation could be a powerful tool to demonstrate that the spatial confinement of LK is not an impossible obstacle to overcome.

Recently, Roue and Nakashima (2018) argued for a need to go beyond validation of LK towards co-production of knowledge, an approach gaining increasing attention (Berkes 2009, Tengö et al. 2014, Harvey et al. 2019). In co-production, different knowledges (i.e. scientific and local) are seen as equal (Nightingale et al. 2019), and different stakeholders engage in an open dialogue through which they share their understandings, identify similarities and differences and come up with a joint understanding (Roue and Nakashima 2018). Therefore, it is recommended to consider this type of approach in Malawi, for which extensive further research would be needed, especially taking into account that there is little guidance available on how to operationalise co-production in practice (Harvey et al. 2019).

In Section 6.2.1.4, an example was given where FGD participants in two instances mentioned that they prefer LK since there is no proof for them that the scientific warning information works (i.e. in their words: because they have not seen it in a form of a plant or animal behaviour). This piece of evidence suggests an interesting aspect: as external stakeholders require a proof in the form of validation that LK works, some community members need proof to accept scientific knowledge. What this implies is that people judge

the viability of knowledge depending on their epistemological stance (i.e. seeing what is valid knowledge). This can serve as a strong argument for co-production, since it is a process based on equalities of knowledges. However, as mentioned, a further and in-depth study is needed.

8.6.2.3 *Knowledge integration*

Many research participants, especially external stakeholders, emphasised a need for integrating LK and SK, which mirrors wider calls from the literature (Mercer et al. 2010, Audefroy and Sánchez 2017, Balay-As et al. 2018, Acharya and Prakash 2019). Furthermore, as presented in Section 6.2.1, communities identified advantages and disadvantages of both LK and knowledge they receive through external approaches. Therefore, there is a clear need for integration through which strengths of different knowledge systems can be utilised (Plotz et al. 2017), as no single knowledge can tackle the gravity of challenges such as climate change (Nightingale et al. 2019). As elaborated in Section 7.3, while conducting the interviews with external stakeholders, it was difficult to distinguish between ‘integration’ and ‘validation’. This is due to the fact that ‘integration’ was predominantly conceptualised as what this chapter (Section 8.6.2.3) partly proposes as ‘validation’, i.e. validating LK with scientific knowledge, which is in line with a definition of knowledge integration proposed by Tengö et al. (2014). Therefore, the integration approach presented throughout this chapter resembles what Tengö et al. (2014, p.582) coin as ‘*cross-fertilisation of knowledge*’, where different knowledges enrich one another as needed, contributing with their own strengths.

While integration was not an exclusive focus of this research and it was out of the scope to propose another process (a brief overview of integration processes was provided in Section 2.4.4), several recommendations on how to approach integration are given:

- **Integrating validated LK:** upon creating evidence through approaches explained in the previous section, some dimensions of LK could be readily integrated into official approaches. For instance, peoples’ recollection of flood extents and water depths can be used for the calibration of hydrodynamic models, an approach already piloted in Malawi, but not widely applied (Chapter 7). Furthermore, upon monitoring and/or finding a scientific explanation for some of the local EW indicators, these could be used both for localisation of the currently low-resolution official warning information and for raising awareness (e.g. when communicating

seasonal forecasts on the radio, also communicate what people observed on the ground). Practical frameworks developed in similar settings can be applied upon contextualisation. For instance, approaches have been developed in Ethiopia (Iticha and Husen 2019), and Kenya, Tanzania and Uganda (Plotz et al. 2017) that show that integration of LK in scientific weather forecasting can improve community resilience to climate change and variability, including increased preparedness and action for floods. Further examples can be proposed (e.g. designing guidelines for flood resilient housing that incorporate local practices of raised foundations, using indigenous and locally available materials for reinforcing the river banks).

- **Identify opportunities for and supporting local level integration:** the research has demonstrated that integration is already happening at individual, household, and community levels. Through this process, hybridised knowledge is created. Therefore, taking stock of these integration practices and identifying and promoting learnings within a community and external parties working with communities should be undertaken. Taking into account that not everyone in the community has the same access to integration, it is important to provide support to local people, in order to enhance the process. For instance, Balehegn et al. (2019) argued that the best entry point for integrating between different knowledges at local scale in terms of forecasting is to improve people's accessibility to official information.
- **Integration at district and national level:** documented and validated LK, as well as LK widely applied and trusted by community members should be integrated at district and national levels: for example, inclusion of local EW indicators in district contingency plans and consolidation of hazard and vulnerability maps at district levels. Integration at national level could be facilitated through wider inclusion in policies; for instance, local level construction practices that are proven effective could be explicitly included in building codes.

To operationalise the recommendations for knowledge integration and validation proposed herein, a multi-stakeholder approach is required. Most importantly, communities need to be central to the process, and act like local researchers, which is in line with recommendations from the literature (Hiwasaki et al. 2014a, Gaillard 2019). This requires partnership, with a special role of NGOs working with communities, and local government, which as mentioned in Section 7.3 should be involved for the purpose

of sustainability. Finally, local research institutions (i.e. Malawian universities and research institutes) should be an integral part of the process.

8.6.2.4 Dissemination

The final step in changing the attitudes is dissemination of validated and integrated LK to different stakeholder groups (communities, local and national government, NGOs at local and national levels, and the international donor community). At community levels, external stakeholders could facilitate organisation of workshops where effective LK practices would be promoted, and development of educational materials (e.g. see Hiwasaki et al., 2014a) for sharing LK, that would especially be tailored towards younger community members. In order to reach a larger audience, and taking into account the importance of radios in case study communities, local radio stations could also discuss LK and showcase good practices.

At district levels, training could be developed in order for members of the DCPC to be made aware of the importance of including LK in their planning, and presented with examples of proven practices from local levels. Presented with the evidence, local governments and NGOs included in advocacy could focus on advocating for the importance of increased inclusion of LK in policies at national levels. Similarly, the evidence created could be used as an advocacy tool to solicit more funding from donors.

Finally, and as recommended by external stakeholders, LK could be disseminated by its integration into the education curricula, from primary education to higher. This could be especially useful, since, as empirical results from Chapter 6 suggest, communities felt that those individuals who received some form of education might feel that LK is backwards, which can be explained by a general lack of inclusion of LK into a school curricula. The integration of LK in official education has been recognised as a way to decolonise education curricula in African countries (Owuor 2007). This integration should be done under the umbrella of a wider integration of DRR into school curricula, advocated by the Sendai Framework (UNDRR 2015). Therefore, LK across the FRM cycle can be taught in relation to wider DRR education on the topics of mitigation, preparedness, response and recovery. For instance, children in primary school living in the Lower Shire Valley can be taught the ways to be prepared for the flood, including identified local EW indicators and a range of early actions (Chapter 5). At the university levels, while studying for degrees in engineering and physical sciences, students could be

taught (for instance) about different ways in which LK can support their flood modelling efforts.

8.7 Chapter summary

Chapter 8 discussed the complexity of approaching LK under the realm of community-based approaches. Although the very concept of these approaches is supposed to create a platform for the enhanced role of LK, empirical investigation conducted within this research suggests that the practical experiences are far more complex. Some of the main points discussed are as follows:

- **Dimensions of LK:** LK is rich, diverse and composed of different dimensions.
- **Heterogeneity of LK:** LK is not homogenous within a community, different people have different knowledge, there are discrepancies in the extent of knowledge use, people have different attitudes towards LK, and most importantly, not everyone in the community has the same access to LK. Therefore, there is a socio-economic and political component to LK that needs to be considered.
- **Dynamics in LK production:** LK is constantly produced and reproduced, and while some knowledge becomes obsolete, new knowledge emerges. There is an ongoing and informal process of knowledge integration, where local people are constantly triangulating different knowledges.
- **Identification of LK limitations:** LK is exposed to unprecedented challenges, for instance, climate change and environmental degradation, which have changed the very nature of flooding at local levels and impose limitations to LK (e.g. more extreme flooding). LK is influenced by processes and agendas that stem outside the communities' imminent locations and influence, and that generate vulnerabilities in the first place.

Section 8.2 demonstrated that the current setup of CBFRM in Malawi creates obstacles that make enhanced use of LK challenging. These include the existing community participation practices, financial constraints and capacity of NGOs and government, the donor landscape, information consolidation and sharing, and attitudes of external stakeholders towards LK.

Based on the obstacles identified, this chapter has provided practical recommendations for enhancing the role of LK in Malawi. In order to raise a profile and use of LK in

Malawi, a requirement is to improve the existing participatory practice, increase information sharing to allow for better coordination of activities at district levels, and change the financing landscape by releasing operational funds at district levels and donor funding oriented towards longer term projects. Finally, in order to challenge existing attitudes, there is a need to build evidence for LK, and so a simple procedure that would allow for documentation, validation, integration and dissemination of LK was proposed.

Chapter 9- Conclusions

This thesis sought to critically assess the role of LK in community-based approaches to DRR and explore the barriers to and opportunities for its enhanced use, with a focus on LK and CBFRM in Malawi. The analysis was based on the empirical data collected through three periods of fieldwork in the Lower Shire Valley in Malawi. The topics were investigated through a multi-actor perspective, by engaging with various stakeholders (i.e. local communities, NGOs, government representatives, and FRM consultants). This final chapter will emphasise the main findings of the study, summarise the core research contributions, present limitations of the research, and recommend avenues for further research.

9.1 Summary of the main findings

9.1.1 *Community-based approaches to flood risk management*

CBFRM in Malawi is the main approach to manage and reduce flood risks in the country. Through CBFRM, there is an ongoing effort to change the nature of FRM in Malawi from relief and response-oriented (although these still remain prominent components) towards more anticipatory approaches, aimed at risk reduction, preparedness and an overall increase in community resilience. However, current CBFRM is characterised by short-term and often donor-driven interventions, and it does little in tackling the underlying causes of vulnerability. Therefore, the findings suggest that CBFRM in Malawi only marginally improves the situation on the ground, while long-lasting and transformative solutions remain undelivered.

The existing government policies recognise the importance of community-based approaches, and a decentralised institutional structure that ought to facilitate the delivery of CBFRM on the ground has been established. Yet, this does not translate into a smooth practical realisation. Based on in-depth accounts from local communities, government, and NGOs, a number of challenges impeding the realisation of sustainable outcomes have been identified. These are both internally created (i.e. within a specific stakeholder group) and externally imposed (i.e. through the interaction of one stakeholder group with another) and result in a practical realisation of CBFRM that is mismatched to the theoretical proposition of CBDRR approaches. The empirical evidence showed that some of the core components of a ‘good-practice’ community-based approach, such as extensive participation of local communities and sustainability of implemented projects,

are limited in the current setup. CBFRM in Malawi is characterised by a lack of dedicated funding source, a weak government that heavily relies on NGOs and donors, agendas which are often donor-driven, lack of coordination and collaboration between different stakeholders, and absence of accountability. Moreover, expectant and dependant behaviour of both local government and local communities clearly undermines the sustainability of CBFRM interventions.

This research argues that the identification of challenges that occur in the everyday practical implementation of CBDRR is the first step towards the development of improved strategies, as revealing challenges can clearly identify a way forward. In this process, it is of utmost importance to account for the experiences of all relevant stakeholders of CBDRR, as multiple perspectives allow for the creation of an integrated insight.

9.1.2 The concept of local knowledge for flood risk management

This research has documented LK in the Lower Shire, and demonstrated that local communities have a complex, multi-layered and sophisticated knowledge regarding floods in their localities; thus, it is clear that this knowledge presents an important resource for FRM. This knowledge is used before, during, and after floods and also includes cross-cutting components of knowledge of flood hazards and the role of local institutions, leaders, and social networks. This diversity of LK indicates that communities living in flood-prone areas and exposed to recurrent flooding are anything but passive victims. On the contrary, they are active players capable of innovating in the face of a threat and should be recognised as such in the design and implementation of practical approaches and policies.

Documentation of LK is useful to aid the understanding of the potential LK has for FRM. However, as identified, a more thorough critical analysis is needed, as it allows for understanding the process perspectives on LK. The research has demonstrated the dynamism of LK for FRM. It is the knowledge that local people have learned from their elders, as well as the knowledge people gain through their ongoing experience with flooding. However, once learned, this knowledge is not ‘frozen’ in time - it is rather constantly re-learned, evolving and incorporating new understandings, brought about by, for instance, the occurrence of extreme events and exposure to new external knowledge reaching communities (including through CBFRM). In the light of external pressures,

such as climate change, environmental degradation, and the penetration of external approaches and technologies, some LK becomes obsolete, while new LK emerges.

Moreover, the hybrid nature of LK was revealed, an important aspect to consider in FRM, especially in geographical contexts such as Malawi, where local communities are exposed to a number of development activities, including CBFRM. The findings show that people appropriate, internalise and integrate external knowledge in their approaches, in an informal and unstructured process primarily happening at individual and household levels, but also at community levels. Therefore, it can be concluded that there is a thin and blurred line between what is LK and what is external knowledge. Hence, there is more value in thinking about hybrid knowledge, as opposed to an unhelpful focus tailored towards a binary view on LK versus scientific/external/Western knowledge.

Different people have different knowledge and use knowledge differently. For instance, farmers have different knowledge than fishermen, there was a strong intergenerational gap in knowledge use, and factors such as gender, education, access to training and external knowledge also play a role. A particularly important aspect is that not everyone in the community has the same access to LK, as this is conditioned by their access to resources and position within society.

This thesis argues for a more critical outlook on LK, and differentiated access to LK is one of the reasons why, as it reveals that not even LK is equally available to everyone. However, there are other equally important aspects. First, the fact that people have LK does not mean they necessarily use it; hence, CBFRM should be cautious not to make false assumptions that all members of the community equally rely on LK. Secondly, local people describe what can be characterised as decreasing importance and application of LK. Among others (e.g. exposure to technologies), this is influenced by processes such as climate change and environmental degradation, which have resulted in changes in the types of flooding experienced at local levels as well as increased frequencies and magnitudes of flooding. In addition to changing people's attitudes to their LK, these changes have also resulted in LK not longer being as useful and clearly demonstrate the limitations of LK. Therefore, people's attitudes of their own knowledge need to be considered in the international narratives that are increasingly promoting the use of LK; albeit, in an uncritical manner and with insufficient engagement with the complexities

and realities of LK, which can only be uncovered by considering the views of knowledge holders themselves.

By taking into account that local people have limited influence on climate change, environmental degradation, the processes that create poverty, and the decisions that determine the implementation of CBFRM, this thesis argues that LK is influenced by processes and agendas that stem outside the communities' imminent locations and influence. Therefore, uncritically labelling communities as resilient because they possess LK greatly simplifies the complexity of local realities and shifts attention away from the social, economic and political inequalities that (1) generate vulnerabilities in the first place and (2) limit people's capacity to deal with flooding, including their ability to apply different aspects of LK. The focus on people's strengths, including LK, is indeed helpful, as it indicates that they are not helpless victims; however, it is important to be realistic of about how much people can do by themselves, and do as much as possible to reduce the underlying causes of vulnerability as well as supporting existing strengths.

9.1.3 Local knowledge in community-based flood risk management

The results suggest a rising interest in LK for FRM in Malawi, and although the research found examples of both explicit (e.g. local level planning, awareness-raising campaigns, use of local materials and workforce) and implicit (i.e. encouragement of communities to use their knowledge) use of LK in CBFRM, the narratives from local communities and external stakeholders indicated that LK is currently underutilised. The participants from NGOs, government and consultancy identified a number of challenges that make the enhanced use of LK problematic. These included the very characteristics of LK (e.g. spatially bound, not documented, held by specific individuals) but also the fact that no evidence for its effectiveness is available, which was identified as the biggest challenge. Moreover, the accuracy and applicability of LK were challenged.

However, the consideration of these identified challenges presents only a part of the understanding of why LK is underutilised. The current setup and practice of CBFRM in Malawi does not sufficiently facilitate the comprehensive inclusion of LK. Five prime obstacles in the current system were identified, all effectively shaping the existing landscape of LK appropriation in CBFRM. These include: i) community participation practices, ii) financial constraints and capacity of NGOs and government, iii) the donor landscape, iv) information consolidation and sharing, and v) external stakeholders'

attitudes. What this suggests is that the existing rhetoric of LK importance and inclusion is of little practical significance in a system already experiencing significant challenges. Moreover, CBFRM in Malawi does not sufficiently consider important aspects of LK, such as the fact that people have differentiated access to LK and that LK is not a homogenous body of knowledge within a community. Furthermore, the accounts of external stakeholders indicated a focus on the content of LK, and mostly, its early warning component.

The research argues that views of external stakeholders directly shape and influence the extent of LK use under the umbrella of CBFRM, which presents a significant finding and contributes to the gaps identified in the literature. For instance, it was revealed that LK is often perceived as backward, and as a knowledge that fails to incorporate learning. Moreover, constant calls for ‘proof of concept’ through provision of a scientific explanation for LK reveal that LK is not seen as having its own agency, but is rather deemed appropriate for use only after it is put into scientific frames of understanding. Similarly, the main perceived benefit of LK is that it improves the acceptance of external intervention. This indicates the unequal power relation between LK and the knowledge of external stakeholders and reveals that CBFRM, an approach theoretically based on participation and the value of LK, does not sufficiently challenge the dichotomy between local and scientific knowledge that ultimately results in marginalisation of the former.

Taking into account the underutilisation of LK, and based on practical realities from the ground, several avenues for enhancing the role of LK were proposed. These included changes in participation practice (e.g. introducing transparency in the selection of VCPCs, inclusion of elderly people in the work of VCPCs, involving communities in policymaking); improved information sharing and coordination between different stakeholders (e.g. sharing and consolidation of village-level information and district levels); and increase in financing for DRR (e.g. creating a dedicated DRR funding source for local government, donors funding long-term projects). Moreover, a systematic approach for building evidence for LK as a tool for challenging the attitudes of external stakeholders was recommended. This includes documentation of LK and its validation and integration, followed by dissemination to communities, external stakeholders and donors. Throughout these recommendations, a need for acknowledging the equality of knowledges and involvement of various stakeholders was emphasised.

9.2 Thesis contributions

9.2.1 Contributions to knowledge

In terms of *methodology*, the research has demonstrated the value of exploring the topic of LK and CBFRM through a lens of multiple stakeholders, as it allows for capturing the various narratives that ultimately shape the position of LK within an established approach for risk reduction and management. In the disaster literature, LK is predominantly approached through studying it through a community lens (e.g. Santha et al. 2014, Islam et al. 2018, Acharya and Prakash 2019), while the perspectives of those working with communities remain disregarded and are seldom explored in detail (Cook 2015, and to some extent Dube and Munsaka 2018). Yet, this thesis demonstrated that if LK is to be increasingly used in CBFRM, perspectives of all involved stakeholders need to be taken into consideration, as different stakeholder groups hold their own views and operate under their own circumstances. Moreover, valuable insights exposing the current obstacles limiting the enhanced use of LK can be identified only through accounting for all ‘sides of the story’.

In terms of *literature*, this research provides important empirical evidence that contributes to research on both CBDRR and LK. The primary contribution of this research is that it explicitly investigated the role of LK under the realm of CBFRM, and in the process, it demonstrated how CBFRM practice fails to facilitate the inclusion of LK. Although studies regularly emphasise that LK is one of the cornerstones of CBDRR, there is a scarcity of studies analytically exploring the interaction between the two. This thesis has identified the components in CBFRM that present obstacles for the enhanced inclusion of LK, which presents a valuable contribution to the literature and answers the calls from previous studies for further exploration of how LK interacts with official approaches and wider development (e.g. Smith 2011, Naess 2013, Carby 2015).

Furthermore, this thesis has contributed to the identified research gaps regarding (1) how the theoretical propositions of CBDRR translate into practical outcomes on the ground (Van Niekerk et al. 2018), and (2) the need for additional empirical evidence on the real-life experiences of CBDRR (Allen 2006, Lassa et al. 2018). In addition, this thesis is the first study of CBDRR in the Malawian context.

The research has added an extensive case study to the existing literature on LK in disaster research. This involved documentation of LK for FRM in a Malawian context, thus answering to the calls from the literature asking for more studies in the African context (e.g. Mavhura et al. 2013, Iloka 2016, Dube and Munsaka 2018). Furthermore, the evidence presented throughout this thesis engaged with the process perspectives of LK, much called for both in DRR as well as the wider development literature (e.g. Dekens 2007, Briggs 2013, Rahman et al. 2018, Kerr et al. 2018). Therefore, a step further from mere documentation of LK, which is the overwhelming focus of LK studies in disaster literature, was made. This unveiled several important aspects; for instance, the extent of the influence external knowledge coming to communities has on LK and its production, and the importance of critical assessment in the light of global changes, as well as how LK is strongly intertwined with social, economic and political realities at local levels. Finally, the findings on how external stakeholders view LK and the prominence of their attitudes in its overall position makes this one of the first studies dealing with this aspect.

9.2.2 Contributions to policy

Multiple challenges experienced in facilitating the participation of local communities were identified, which demonstrates that policies need to move from mere recognition of the importance of community participation to recommending a set of practical policy implementation guidance and tools. By identifying how a lack of information consolidation and sharing hinders CBFRM efforts, and by inference inclusion of LK, a need for policy instruments at the level of local government that will mandate different stakeholders to share information was revealed. The in-depth consideration of LK presented throughout herein can serve as a basis for advocacy for further inclusion of LK in local and national policies; most notably, its explicit inclusion in the National Disaster Risk Management Policy and Disaster Risk Management Plans at district levels. However, it is important that the recognition of LK is not only rhetorical but accompanied by practical policy tools that would allow its enhanced use. For instance, local governments should be supported through a dedicated funding source which could be used for increased interaction with VCPCs, who should be supported in documenting LK in their respective locations.

9.2.3 Contributions to practice

The study revealed challenges in current CBFRM in Malawi, thus identifying areas that are in need of improvement. These can serve as indicators to practitioners as to how they can improve their approaches. For instance, local government needs to be more involved

in implementation and monitoring of CBFRM projects, NGOs need to be more accountable to local government and communities, and VCPCs need to monitor and maintain implemented projects to increase sustainability.

Furthermore, the different dimensions of LK for FRM identified in Chapter 5 can serve as a starting point and a blueprint for potential LK documentation efforts. Detailed recommendations on enhancing the role of LK were provided in Chapter 8, and these can provide a basis for stakeholders working with local communities on how to document, validate, integrate and disseminate LK for FRM.

9.3 Research limitations

In order to maintain transparency and place research findings in context, it is important to reflect on the limitations of the present study. The first limitation was the timing of the study since the data were collected after the extreme floods of January 2015 and a severe dry spell in 2016. Both of these events were of unprecedented nature and had devastating effects on local communities, possibly influencing how participants involved in the study saw the agency of LK. Therefore, when asking questions, a special emphasis was given to emphasising that the views sought should not be fixated on these given events, but be rather based on participants overall experience with LK.

Secondly, the researcher does not speak local languages (i.e. Chichewa and Sena), which meant that the flow of the conversation was sometimes interrupted since the research assistants were providing a translated summary of what the participants were saying so that the researcher could follow up with new questions. However, this presents the reality of research in an international setting. This limitation was mediated by a word-by-word translation of the recordings of FGDs afterward, while KIIs recording were not translated due to practical considerations. This might have resulted in the omission of some insightful narratives.

Furthermore, as explained in the methodological chapter, chiefs were used as an entry point to local communities and were instrumental in assisting the selection of research participants. Consequently, this might have at times resulted in elite capture, since chiefs might have recommended individuals they have connections with. Every effort was made to communicate the criteria for participants very clearly and it is the general impression of the researcher that participants involved in the study had a genuine experience with

flooding and represented various community groups. This limitation represents again a methodological reality of doing research in context different from that of the researcher.

Fourthly, as argued by the literature, since LK is often embedded in everyday practices and tacit, it is sometimes difficult to express in words. Using methodological instruments that rely on language as a principal tool for knowledge transmission meant that some of the LK dimensions might have stayed uncovered, as they could only be revealed through a prolonged ethnographic stay and immersion in the everyday life of local people. However, the question design and the focus on different stages of FRM (i.e. before, during and after the flood) tried to ensure the discovery of as many dimensions as possible.

Moreover, the choice of case study areas was determined by practicalities and the safety of the researcher. The members of the local government, as well as participants from the NGOs, advised the researcher to choose Traditional Authority Nyachikadza from Nsanje as one of the case studies since they thought this is the best possible case study to explore the richness of LK. This is due to the fact that Nyachikadza is an island in the Shire River which regularly floods. However, access to the communities in Nyachikadza was deemed dangerous, since it would require transport by canoes in an area with a high population of crocodiles; therefore, this site was not included in the study.

9.4 Recommendations for further research studies

This project has provided some key insights into the role of LK in CBDRR, as well as offering separate understanding for both the concept of LK and the practice of CBDRR. It has simultaneously identified avenues for further research. In terms of community-based approaches, the study confirmed the importance of CBFRM as an approach to deal with FRM in the country. However, the extent to which CBFRM reduces the actual flood risk remains an open question. Therefore, it is recommended to conduct further enquiries that would quantitatively assess the impact of CBFRM on flood risk reduction; for instance, through developing hydrodynamic flood models and testing how different combinations of measures employed through CBFRM affect flood hazard. These types of studies could serve as an evidence-building tool and contribute to building robust business-cases for CBFRM, aimed at donors and national governments, thus influencing policy development and financial landscapes. Furthermore, given that this research indicated a lack of sustainability of CBFRM projects, it is recommended that longitudinal studies are conducted through forming partnerships between NGOs and academia. These



studies could focus on the evaluation of CBFRM interventions from the beginning of the project to well after the project has been implemented on the ground. As a result, more detailed understanding of the factors and processes influencing project sustainability (or a lack thereof) could be developed.

Regarding LK, the research findings identified a necessity to find innovative approaches for the integration and co-production of knowledge, and given the rising interest in the topic, it is of utmost importance to conduct further studies. It is recommended to place the emphasis on exploring what are the most effective mechanisms for knowledge exchange and how to facilitate learning processes where equal weights to different knowledges are given. Furthermore, this study interviewed members of NGOs at district and national levels. It would be of interest to explore how members of the international development community located in their respective headquarters (e.g. including INGOs, multi and bi-lateral agencies and donors) view and account for LK in their programming, and what is the extent to which this influences actual knowledge inclusion on the ground. Finally, the present research focused only on the hazard of flooding, although the case study areas experience significant problems with droughts and dry spells. Disaster research and practice are increasingly orienting themselves towards multi-hazard approaches, based on the understanding that many areas are exposed and vulnerable to more than one hazard. Therefore, it is recommended to conduct a study of LK taking into account the multi-hazardous aspect and exploring synergies and trade-offs between LK used for different hazards within the same geographical area.

This study has provided useful insights into how the current setup and practice influence the extent of use of LK for CBDRR in Malawi. In order to gain further understanding, there is a need to conduct similar studies in different geographical contexts. Since CBDRR is a commonly employed approach across the Global South, aimed at increasing the resilience of local communities that have abundant LK, the portfolio of possible case studies is wide. It would be of special interest to conduct these studies in collaboration with an NGO partner agency implementing projects on the ground.

Appendix 1: The approval obtained by local government for conducting research in Chikwawa and Nsanje

Appendix 1a: Approval for conducting research in Chikwawa



All correspondence to be addressed to the Principal

University of Malawi – The Polytechnic
Private Bag 303
Chichiri
Blantyre 3, Malawi
Tel: (+265) 1 870 411
Fax: (+265) 1 870 678
E-Mail: principal@poly.ac.mw

PRINCIPAL
Prof Grant Kulalanga, PhD, Eng., MSc, Eng, BSc, Eng., MASCE

Our Ref.: 18/58
Your Ref:
Date: 14 June 2017

The Chief Executive Officer
Chikwawa District Council
Private Bag 32
Chikwawa.

Dear Sir/Madam

cc:
- Paramount Chief Lundu
- TA Maseya
- TA Makhusia


Please assist the bearer.
24/06/17

Re: ROBERT SAKIC TROGRIC

Robert Sakic Trogrlic is a PhD student in the School of Energy, Geoscience, Infrastructure and Society at Heriot Watt University, UK. He is in Malawi on a field visit for his research. His research dwells on the role of local knowledge in community-based flood risk management with a focus on Nsanje and Chikwawa. He will be in the country from 12th June to 21st August, 2017. During his visit, Robert is planning to meet local communities, NGOs and government workers in Nsanje and Chikwawa.

Whilst in Malawi, the student is under my supervision as contact person for the collaboration between University of Malawi, The Polytechnic and Heriot Watt University. Should you require more information, please contact me.

Regards



Faidess D. Mwale (PhD)
HOD – Civil Engineering Department

Cell: 0888 34 58 56
Email: fmwale@poly.ac.mw

CC: Dean- Engineering

†

Centre of excellence in scientific and technological education and training
www.poly.ac.mw

257

Appendix 1b: Approval for conducting research in Nsanje



Handwritten signatures and initials:
J. K. D.
A. B. D.
C. H.

All correspondence to be addressed to the Principal

University of Malawi – The Polytechnic
Private Bag 303
Chichiri
Blantyre 3, Malawi
Tel: (+265) 1 870 411
Fax: (+265) 1 870 578
E-Mail: principal@poly.ac.mw

PRINCIPAL
Prof Grant Kululunga, PhD. Eng., MSc. Eng., BSc. Eng., MASCE

Our Ref.: 19/5/6
Your Ref.:
Date: 14 June 2017

The Chief Executive Officer
Nsanje District Council
Private Bag 1
Nsanje.



Dear Sir/Madam

Re: ROBERT SAKIC TROGRIC

Robert Sakic Trogrlic is a PhD student in the School of Energy, Geoscience, Infrastructure and Society at Heriot Watt University, UK. He is in Malawi on a field visit for his research. His research dwells on the role of local knowledge in community-based flood risk management with a focus on Nsanje and Chikwawa. He will be in the country from 12th June to 21st August, 2017. During his visit, Robert is planning to meet local communities, NGOs and government workers in Nsanje and Chikwawa.

Whilst in Malawi, the student is under my supervision as contact person for the collaboration between University of Malawi, The Polytechnic and Heriot Watt University. Should you require more information, please contact me.

Regards

Faideess D. Mwale (PhD)
HOD – Civil Engineering Department

Cell: 0888 34 58 56
Email: fmwale@poly.ac.mw

CC: Dean- Engineering

Appendix 2: Overview of case studies and research participants

Appendix 2a: Overview of case studies and participants during scoping study in March 2016

| Stakeholder group | District | Group Village Head (GVH) | Number of participants | Male | Female |
|---------------------|----------|--------------------------|------------------------|-----------|-----------|
| Communities (VCPC) | Nsanje | Bitrinyu | 10 | 7 | 3 |
| | | Nyathando | 11 | 8 | 3 |
| | | Mbenje | 7 | 5 | 2 |
| | | Nyan'ga | 10 | 6 | 4 |
| | Chikwawa | Chikhamwi | 16 | 12 | 5 |
| | | Medram | 7 | 3 | 4 |
| | | Khunghbwe | 9 | 5 | 4 |
| Total number | | | 70 | 45 | 25 |
| NGOs | Nsanje | - | 3 | | |
| NGOs | Nsanje | - | 8 | | |
| Total number | | | 11 | | |
| DCPC | Nsanje | - | 9 | | |
| DCPC | Chikwawa | - | 17 | | |
| Total number | | | 26 | | |

Appendix 2b: Overview of case studies and participants during the main period of fieldwork from June to September 2017

| Stakeholder group | Districts | Group Village Head (GVH) | FGD M | FGD F | KII M | KII F |
|-------------------|-----------|--------------------------|------------------------|-------|-------|-------|
| Communities | Chikwawa | Tizola* | 7 | 5 | - | - |
| | | Kanseche | 7 | 5 | 5 | 4 |
| | | Misli | 8 | 8 | 4 | 2 |
| | | Mmodzi | 8 | 8 | 3 | 2 |
| | | ACPC Maseya* | 7 | 3 | - | - |
| | Nsanje | Mbenje | 8 | 8 | 4 | 1 |
| | | Nyanga | 8 | 8 | 3 | 2 |
| | | Tengani | 7 | 7 | 4 | 2 |
| | | ACPC Tengani* | 6 | 2 | - | - |
| Number per gender | | | 66 | 54 | 23 | 13 |
| Total number | | | 120 | | 36 | |
| | | | Number of participants | | | |
| DCPC | Chikwawa | - | 8 | | | |
| Total number | | | 8 | | | |
| NGOs | Chikwawa | - | 5 | | | |
| NGOs | Nsanje | - | 6 | | | |
| Total number | | | 11 | | | |

*These FGDs were not gender separated

Appendix 2c: Overview of case studies and participants during the consultancy study in September and October 2017*

| District | Group Village Head (GVH) | FGD M | FGD F | KII |
|---------------------|---------------------------------------|------------|-----------|-----------|
| Chikwawa | Lundu | | no data | 1 |
| | Tiyimbe nawo | 6 | 10 | 1 |
| | Mwananjovu | no data | no data | 2 |
| | Mchacha | no data | no data | 1 |
| | Khungubwe | 8 | 11 | 1 |
| | Mtwana | 7 | no data | 1 |
| | Kajawo | 8 | no data | 1 |
| | Kalima | no data | | 1 |
| | Nyang'a | 8 | no data | 2 |
| Nsanje | Bande | | 9 | 2 |
| | Kamanga | 8 | 10 | 1 |
| | Gooke | 5 | 10 | 2 |
| | Namanya | 6 | 10 | 2 |
| | Gugumiya | 9 | 8 | 2 |
| | Karonga | 9 | 8 | 1 |
| | Osiyana | 9 | 8 | 2 |
| | Chapinga | 7 | 8 | 2 |
| | <i>Number per gender (data known)</i> | <i>90</i> | <i>92</i> | |
| Total number | | 182 | | 25 |

* In some of the cases, research assistants during the consultancy study failed to submit sign-in sheets; hence, the total number of participants in FGDs during the consultancy study is unknown.

Appendix 3: Questions used for data collection

Appendix 3a: Focus group discussions guide for communities used during the scoping study

1. Can you please tell me about a recent flooding event and their impacts on your community?
2. Are there any projects in your community related to flood risk reduction?
3. Have you been/ Are you involved in the projects?
4. Do you find the projects helpful?
5. What do you think can be done that would help you mainly with a flooding situation?

Appendix 3b: Focus group discussion guide for NGOs used during the scoping study

1. Can you tell me shortly on what kind of projects are you working on in the communities?
2. How do you cooperate with the local community in the process?
3. Are you doing any data collection/ documenting the projects?
4. What are the main problems you discover in community based flood risk management?
5. What do you think are most needed improvements to increase the number and efficiency of community based projects?

Appendix 3c: Focus group discussion guide for local governments used during the scoping study

1. What is a role of the district in flood risk management?
2. Can you shortly tell me about some recent flooding event and what were the impacts for you?
3. Who is mainly working on the community based flood risk reduction projects in the districts?
4. What kind of projects?
5. What do you think about the degree of involvement of communities in projects?
6. What do you think are most needed improvements to increase the number and efficiency of community-based projects?

Appendix 3d: Guiding questions for the interviews and FGDs with communities used during the main fieldwork

1. GENERAL INFORMATION ABOUT FLOODING

- a.** How often, when and why do floods happen in your community?
- b.** How does flooding impact your community?
- c.** In your opinion, are floods increasing, decreasing or they are the same in your community?
- d.** Can you remember some flooding events that impacted you?
- e.** In your opinion, what characteristics and structure does your community have that helps you in managing flooding?

2. LOCAL KNOWLEDGE FOR FLOOD RISK MANAGEMENT

- a.** What do you understand by the term local knowledge for flood management?
- b.** What is the local knowledge that helps your community with flooding?

SUBQUESTIONS

- i.** What is this local knowledge you are using BEFORE the flood?
 - ii.** What is this local knowledge you are using DURING the flood?
 - iii.** What is this local knowledge you are using AFTER the flood?
- c.** What is the most useful local knowledge for you?

3. STATUS OF LOCAL KNOWLEDGE: NOW AND THEN

- a.** In your opinion, is there a difference in the use of local knowledge for flood management now compared to in the past?
- b.** In your opinion, does local knowledge has the same importance in the communities now compared to the past?

4. CREATION, HOLDERS AND TRANSMISSION OF LOCAL KNOWLEDGE

- a.** Where do you get the knowledge in relation to flood risk management in general?
- b.** How did you learn about local knowledge?
- c.** What are the ways in which local knowledge is shared in your community?
- d.** What factors influence the use of local knowledge by community members?

5. UNDERSTANDING THE PERCEPTION OF LOCAL KNOWLEDGE

- a.** In your opinion, is local knowledge for flood management useful and beneficial?

- a. What are the main benefits of your local knowledge?
- b. What are the main limitations of your local knowledge?
- c. Did your community receive any training from NGOs/ government on the issues of flood risk management?
- b. How important is your knowledge to your community when compared to training and knowledge you get from NGOs and government doing projects in your community?

6. LOCAL KNOWLEDGE AND OUTSIDERS

- a. In your opinion, do NGOs working in your community on flood management take into account and value your local knowledge?
- b. In your opinion, do governmental organisations working in your community on flood management take into account and value your local knowledge?

7. BARRIERS FOR LOCAL KNOWLEDGE AND ENHANCEMENT OF USE

- a. What do you think are the problems with using local/indigenous knowledge for flood management in your community?
- b. How can these problems be solved?

Appendix 3e: Interview guide for the key informants from the government and NGOs

1. BACKGROUND INFORMATION

- a. Roles and responsibilities
- b. Years with organisation

2. ORGANISATIONAL ROLE IN FLOOD RISK MANAGEMENT/ DRR IN MALAWI

- a. Can you please explain how your Ministry/Department/NGOs is involved in FRM?
- b. What capacities are lacking in flood management in Malawi?
- c. What is needed to improve flood management in Malawi?
- d. What are the challenges of community-based work?

3. USE OF LOCAL KNOWLEDGE

- a. Do you come across local knowledge in your work?
- b. What do you understand under the term local knowledge for flood management?
- c. Do you/ your organisation take into account/ use local knowledge for flood management in your work?

- d. How could local knowledge for FRM be helpful in your work?
 - e. Are you aware of any platforms at national levels established for promoting and sharing local knowledge?
4. PERCEPTION OF LOCAL KNOWLEDGE
- a. In your opinion, does local knowledge has a potential to improve FRM in Malawi?
 - b. What are the benefits/limitations of LK?
 - c. In your opinion, does local knowledge for FRM still presents an important approach to dealing with flooding at local levels?
 - d. How would you rank the importance of LK for FRM when compared to scientific/ professional knowledge?
5. BARRIERS/OPPORTUNITIES FOR LOCAL KNOWLEDGE
- a. In your opinion, how could the use of LK for flood management in Malawi be enhanced?
 - b. What do you see as potential barriers for the more widespread inclusion of LK for FRM?
 - c. How could these barriers be overcome?

Appendix 3f: Focus group discussion guide for the NGOs used during the main fieldwork

1. GENERAL UNDERSTANDING OF LOCAL KNOWLEDGE
- a. What do you understand under by the term local/ knowledge for flood management?
 - b. In your opinion, does local/ knowledge present an important aspect of how communities manage their flooding and can you think of some examples?
2. USE OF LOCAL KNOWLEDGE IN THEIR WORK
- a. How do you/ your organisation integrate and use local knowledge of communities related to flood management in your work?
 - b. At which stages of the project do you use local knowledge related to flood management?
 - c. What are the main aspects of local knowledge related to flood management that you find useful for your work?
 - d. In your work at community level, would you say you are more informed by local knowledge or external knowledge?
3. PERCEPTION OF LOCAL KNOWLEDGE

- a. In your opinion, is local knowledge for flood management provided by communities useful and beneficial?
 - b. What are the main benefits/limitations of local knowledge?
 - c. How would you rate the importance of local knowledge when compared to scientific/professional knowledge?
 - d. In your opinion, is there a difference in the use of local knowledge for flood management now compared to in the past?
4. BARRIERS AND OPPORTUNITIES FOR LOCAL KNOWLEDGE
- a. In your opinion, what are the main problems/challenges for the use of local knowledge in flood risk management?
 - b. What are the ways to overcome these problems and challenges and enhance the role of local knowledge in flood risk management?
 - c. In your opinion, can local knowledge improve flood management / disaster risk reduction in Malawi?

Appendix 3g: Focus group discussion guide for the local government used during the main fieldwork

1. OPENING ON THE AVAILABILITY OF INFORMATION
- a. What are the main sources and types of information at the District Level that are used to guide policy decisions related to FRM/DRR?
 - b. What would you say are the knowledge gaps in relation to flood risk management at the district level and information that would help you in your work?
2. GENERAL UNDERSTANDING OF LOCAL KNOWLEDGE
- a. What do you understand by the term local knowledge for flood management?
 - b. In your opinion, does local knowledge present an important aspect of how communities manage their flooding and can you think of some examples?
3. USE OF LOCAL KNOWLEDGE IN THEIR WORK
- a. Is there a way in which you as DCPC or your respective departments integrate and use local knowledge in your work?
 - b. In your work at community level, would you say you are more informed by local knowledge or external (e.g. scientific risk assessments) knowledge?
4. PERCEPTION OF LOCAL KNOWLEDGE

- a. In your opinion, is local knowledge for flood management by communities useful and beneficial?
- b. What are the main benefits/limitations of local knowledge?
- c. In your opinion, is there a difference in the importance and use of local knowledge for flood management now compared to in the past?
- d. How would you rate importance of local knowledge when compared to scientific and professional knowledge for flood management?

5. LOCAL KNOWLEDGE BARRIERS AND OPPORTUNITIES

- a. In your opinion, what are the main problems/challenges for the use of local knowledge in flood risk management?
- b. What are the ways to overcome these problems and challenges and enhance the role of local knowledge in flood risk management?
- c. In your opinion, can local knowledge improve flood management/ disaster risk reduction in Malawi?

Appendix 3h: Guiding interviews for focus group discussions and key informant interviews used during the consultancy study

OVERVIEW OF THE FLOODING SITUATION IN THE COMMUNITY

- 1. How often floods occur in your community?
- 2. What are the main impacts floods have on your community?

INDIGENOUS EARLY WARNING FOR FLOODING

BEFORE THE FLOOD (FEW MONTHS TO A WEEK BEFORE THE FLOODING EVENT)

INDIGENOUS EARLY WARNING INDICATORS

- 1. How do you know there will be flooding in your community in the rainy season?
What are the indigenous early warning signs that help you to know that the flood is coming?
 - Animal behaviour
 - Plants (e.g. trees, flowers, riverine flora)
 - Celestial bodies (moon, stars, sun)
 - Meteorological (temperature, winds, rainfall, clouds)

ACTIONS TAKEN AND SYSTEMS FOR MESSAGE SHARING

- 1. Is there any action you will take to prepare for the flooding based on the indigenous early warning signs you explained us earlier? What type of action?

- Livelihood modification (e.g. shifting of planting season, change of planting place, change of crops planted)
 - Food and fodder (e.g. food storing)
 - Livestock (e.g. preparation and relocation of livestock)
 - Temporary shelters construction
 - Relocation uplands
 - Preparation of the houses
 - Any other action?
2. Do you share the indigenous early warning signs with the others in your community?
 3. Do you share the indigenous early warning indicators with the NGOs working in your area or with government staff (e.g extension workers)?

IMMEDIATELY BEFORE THE FLOOD (A WEEK BEFORE THE FLOODING EVENT TO THE ACTUAL FLOODING EVENT)

INDIGENOUS EARLY WARNING INDICATORS

1. What are the indigenous early warning signs that help you to know that the flood is coming?
 - Animal behaviour
 - Plants (e.g. trees, flowers, riverine flora)
 - Celestial bodies (moon, stars, sun)
 - Meteorological (temperature, winds, rainfall, clouds)
 - River behaviour

ACTIONS TAKEN AND SYSTEMS FOR MESSAGE SHARING

1. Is there any action you will take to prepare for the flooding based on the indigenous early warning signs you explained us earlier? What type of action?
 - Food
 - Livestock (e.g. preparation and relocation of livestock)
 - Relocation uplands
 - Evacuation
 - Will you monitor the water levels in the river?
 - Any other action?
2. How do you share the early warning message based on the indigenous signs prior to the flooding?
3. Are there any meeting in your village immediately before the floods through which the message is shared?

4. Can you tell based on the indigenous early warning signs immediately before the floods how severe the flooding will be?

RELIABILITY OF INDIGENOUS EARLY WARNING

1. Are the indigenous early warning signs for floods reliable and accurate?

ACCESSIBILITY TO OFFICIAL EARLY WARNING INFORMATION

1. Do you get any official information about the rainfall (e.g. seasonal forecasts)?
2. Do you get any official warning information about flooding in the rainy season?
3. Do you find official warnings you get for floods reliable and accurate?

Appendix 4: Information Sheet and Consent Form



Information and Consent Form

Title of research project:

Local knowledge for community-based flood risk management (CB-FRM) in Malawi

Date of ethics clearance from the School of Energy, Geoscience, Infrastructure and Society: 13.01.2017

Dear participant,

My name is Robert Sakic Trogrlic and I am a research student at the Institute of Infrastructure and Environment, School of Energy, Geoscience, Infrastructure and Society at Heriot-Watt University in United Kingdom. The PhD project is a joint effort between Heriot-Watt University and Polytechnic Malawi in Blantyre. I am working under the primary supervision of Dr Grant Wright in the UK, and supervision from Dr Faidess Mwale from Polytechnic Malawi in Blantyre. I am conducting a study on the role of local knowledge in Community-based Flood Risk Management (CB-FRM) in the Lower Shire Valley, exploring the barriers and opportunities for its enhanced inclusion in the current flood risk management approaches.

The interview will take approximately anytime from 30-60 minutes. I will ask questions related to your work with communities vulnerable to flooding, your/ your institution experience with local knowledge, the opportunities and barriers you see in its widespread application. Please take into account that your participation is voluntary and you can refuse to answer any question that you are not comfortable with, and can withdraw your consent from the interview at any time. Furthermore, you can withdraw your permission to use the data within two weeks of the interview, in which case the material will be deleted. In this case, you can contact me using the contact information provided below. If you wish to see the transcript of the interview, please contact me. Notes will be taken during the interview. I also ask for your permission to audio record the interview, in order to ensure that all the valuable input is documented.

The information shared today is completely confidential, and will be stored securely, assuring anonymity of individuals and/ or institutions. The data collected through the interview will be used for writing a PhD thesis and publishing scientific papers in academic journals (e.g. by using summaries and direct quotations). If you are interested in research findings, they will be shared with you at the time of the completion of this study in September 2019. Your answers will remain anonymous and kept in strictest confidence.

Your assistance will be greatly appreciated. Thank you very much.

Kind regards,

PhD Student: Robert Sakic Trogrlic

e-mail: rs36@hw.ac.uk

PhD Supervisor: Dr Grant Wright

e-mail: g.wright@hw.ac.uk

If you agree to participate and agree with the information provided above, please tick the circles and sign the consent form.

CONSENT FORM

- ☐ I agree to take part in the above research voluntarily, and understand that I can withdraw at any time, without giving a reason.
- ☐ I understand that the data collected will be held in the strictest confidence and my name/ name of my organisation will not be mentioned in the research.
- ☐ I agree for the interview to be recorded.

Date: _____

Name and signature: _____

Appendix 5: Short survey for NGOs and local government during the scoping study fieldwork

Dear participant,

Thank you for taking time and providing useful insight in the focus group. The focus group was organized as a part of a joint PhD research between Heriot- Watt University in Scotland and Polytechnic Malawi in Blantyre. The aim of the study is to understand the existing implementation strategies of community based flood risk management in Malawi and offer possible improvements that would enhance community based resilience. The study will be on- going until 2019, with detailed data collection activities (interviews, focus groups, surveys) in 2017 and 2018. In order to establish contacts and maximize the future efforts of this project, we ask you to fill in a short survey provided below. This survey will take approximately 5 minutes to be filled.

Many thanks for your cooperation,

Kind regards,

Robert Sakic Trogrlic and Dr. Faideess Mwale

1. Organization _____

2. Position _____

3. Years with organization _____

4. Indicate the main Governmental Departments that could be of interest for this study:

- Department of Disaster Management Affairs
- Ministry of Transport and Public Works
- Ministry of Irrigation and Water Development
- Department of Environmental Affairs
- Department of Forestry
- Department of Climate Change and Meteorological Services
- Malawi Police Service and Malawi Defence Forces

5. Indicate NGO's doing flood management projects on a community scale that you feel might be of interest for this study. (Please write down the names of the organizations)

6. Indicate any other organization except of NGOs and the governmental actors that you believe might be of interest for this study. (Please write down the name of the organization).

7. List villages in your District in which flood management projects are taking place.

8. Please indicate to which of the categories provided below do the projects you are working on belong (please cross the circle, multiple choice possible):

- Preparedness (e.g. emergency drills, food and material stocking, early warning systems)
- Prevention/ Mitigation (e.g. levees construction, vulnerability analysis, public education)
- Response/ Relief (e.g. rescue efforts, temporary housing provision)
- Rehabilitation/ Reconstruction (e.g. livelihood support, disaster resilient construction)

If you feel this required further explanation, please describe in the lines provided below:

8. List locations that you feel would be suitable case studies for this research

11. Do you have any additional remarks (comments, advice, further contacts) that you feel would be of help for this study?

If you would be willing to take part in future data collection related to this study, please provide contact details.

E-mail: _____

Appendix 6: List of early warning indicators documented during the consultancy study

Appendix 6a: Animals

| English name | Chichewa Name | Behaviour | Period Observed |
|---------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Ants | Nyerere, Nthendza, Agang'a | Increased number in houses and outside, affecting sleep. Ants are also seen collecting and storing food. | July to December |
| | | Both small and bigger ants observed. | |
| Phyton | Nsato | It stays in a tree, when head pointing downwards means that more rain is coming. In some places, phytons change habitats and come from the rivers to villages. | October to January |
| Hippopotamus | Mvuu | Moves away from the river and walks to the dry land. Floods will follow where the hippo goes, and it will not flood beyond the point hippo reached. | December to January |
| Tortoise | Khachi | Normally not seen, but can be seen near the rivers in the times of flooding. | December to January |
| Frogs | Thesi, Nthesi, Chule | Produce a lot of sound. Immediately before the flood they move around. | September to January |
| Millipede | Dzongololo/ Bongololo | Increased numbers in the villages; produce noise | October to December |
| Birds | Ng'ombe Ng'ombe | Produce a lot of sounds | July to December |
| | Anazeze | Increase number and they fly around | August to November |
| | Mbalambe | Makes sounds and then stops immediately before the rains | December |
| | Nazeze | Increased numbers and fly around more than usual | August to November |
| | Akakowa | Increased numbers next to the river shores and sounds | July to January |
| | Godomola | The sound of the bird | August to October |
| | Mbaichuche | The sound of the bird before the rains | From December |
| | Songwe | The bird has a nest on tall trees and it rests on the nest and faces where the flood is coming | From December |
| Cattle | Ng'ombe | The cattle act excited, chasing each other with raised tails. Animals are at unrest | October to December |
| Ducks | Bakha | Ducks show signs of wanting to be in the waters, such as raising their wings. | October to December |
| Mosquitoes | Udzudzu | Increased number in the villages | August to December |
| Fish | Somba | Fisherman observe a lot of fish and catch more fish than usual. | December to January |
| Grasshoppers | Tsokonombwe | Make a lot of noise, especially during the night. It is often seen hopping all over the bushes. | October to January |

| English name | Chichewa Name | Behaviour | Period Observed |
|--------------|---------------------|---------------------------------------------------------------------------------------------------|-----------------------|
| Porcupine | Chisoni | Seen around the village | September to November |
| Crickets | Nkhululu | Increased number in villages | September to October |
| Rats | Mbewa | Increased occurrence in the villages, serve as food. They change habitats from river to villages. | September to December |
| Hare | Not known | Coming out of the woods into the villages when it rains a lot. | Not specified |
| Antelope | Not known | Coming out of the woods into the villages when it rains a lot. | Not specified |
| Not KNOWN | Nkhaka | Found in the bushes | July to October |
| Spiders | Not known | Coming out of the ground | From October |
| Mopane | Nthowa/ Nthchika | Found in trees all over the area and people eat it. | From December |
| Cat | | Cats always coming from west to east, means heavy rains are near | December-January |
| Snake | | Along the Shire River, big snakes pass in the maize gardens and leaves a mark | November |
| Bed bugs | | Bed bugs in large numbers | From September |

Appendix 6b: Plants

| English name | Chichewa name | Behaviour | Period Observed |
|--------------|------------------|--------------------------------|-----------------------|
| Trees | Mkhunku | Increased flowering | August to November |
| | Janga | Increased flowering | August to November |
| | Mbwemba | Increased production of fruits | August to December |
| | Yembe/ Mtondo | Increased production of fruits | September to December |
| | Magwafa | Increased production of fruits | September to December |
| | Nkuyu | Increased flowering | August to December |
| | Kina/ Nimu | Increased flowering | August to December |
| | Nkolobwe | Increased number of fruits | September to October |
| | Mkotamo | Increased flowering | Not specified |
| | Nyenja | Increased number of fruits | August to October |
| | Phakasa | Increased number of fruits | August to October |
| | Ntondo | Increased number of fruits | August to October |
| | Minyenja | Increased number of fruits | August to October |
| | Kunkhulu | Increased flowering | August to October |

| English name | Chichewa name | Behaviour | Period Observed |
|--------------|-------------------------------------------|--------------------------------------|---------------------|
| | Nyenza | Increased number of fruits | From August |
| | Mkunkhu | Increased flowering | From August |
| | Maswu | Increased flowering | August to November |
| | Chinese dates tree (local name not known) | Increased number of fruits | From July |
| | Indian plums (local name not known) | Increased number of fruits | From July |
| | Chilusa | Increased flowering | January to February |
| | Msolo | Sprouts earlier and usual | Not specified |
| | Nyika | Increased production of water lilies | August to December |

Appendix 6c: Meteorological indicators

| Indicator | Chichewa name | Description | Period observed |
|----------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Very hot temperatures | Kutentha kwamibri/ Ng'amba | Very hot temperatures, beddings are not needed when sleeping. People will sleep outside, and they sweat a lot during the day and at night. When it is hot, more rains come. | August to December |
| Heavy blowing of wind | Mphepo/ Bangula/ Mwera | Wind blowing heavily causing damages to houses (blowing off loafs of the houses). Winds bring dust. | September to January |
| Northern wind | Mbalu/ Mpoto | Wind blowing from north to the south | December |
| Whirlwinds | Kavuluvula | The whirlwinds will occur increasingly | August to December |
| Fog occurrence | Nkhungu | Heavy fog on the mountain, especially the top part | November to December |
| Dark clouds | Mitambo yakuda | Dark clouds appear in the sky | November to January |
| Frequent blowing of winds | Kuzizila | Winds will blow frequently bringing some coldness | September to December |
| Rainfall intensity | Not specified | A lot of rainfall every day, rains come evenly distributed | October to March |
| Southern winds | Not specified | Not specified | Not specified |

| Indicator | Chichewa name | Description | Period observed |
|----------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Changes in rainfall | Not specified | Men go to check and see how the rain is coming. They alert each other and if the rain starts in the morning they do not sleep and stay awake to see the water running. | December to March |
| White clouds | Not specified | White clouds that look like hills | October to March |
| Thick clouds | Not specified | When it is about to flood, clouds come out in large numbers and are thick | December to March |
| Stable clouds | Not specified | If the clouds are stable and settled in one place | Not specified |

Appendix 6d: Riverine indicators

| Indicator | Chichewa name | Description | Period observed |
|-----------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Sound of water from the river | Nthato ikama vumba mu m'ntisnje | The villagers will begin to head an increased sound movement of water from the river. Waters get loud | December - March |
| The rate of water levels increasing | Kukwera kwa madzi m'nstinje | The water levels in the rivers increase at a fast rate, villagers fail to cross the river. The riverbank gets full | Shortly before the floods |
| Increased waste content in the river | Zinyalala madzi | More waste (e.g. grass) in the river | December to February |
| Use of tree branch as a water level monitoring equipment | Nthambi | Branch of any tree and dip it in the river, marked with different layers. When it reaches the upper layer, they know more water is coming | January and February |
| Water velocity | Not specified | Increased velocity, people can't pass a river | December to March |
| Water colours | Not specified | Waters are darker and muddier | October to January |
| Foaming in water | Not specified | Foam is created in waters | December to March |
| Water odour | Not specified | Odour coming out of the river | December to March |
| Debris in waters | Not specified | Increased debris content in the water | December to March |
| A backflow effect | Not specified | Streams flowing into Shire River have backflow effect | December to March |
| River beds dry up earlier | Not specified | It is a sign of an upcoming very rainy season | Not specified |

Appendix 6e: Celestial indicators

| Indicator | Chichewa name | Description | Period Observed |
|---------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------|----------------------|
| Brightness of stars | Nyenyezi | The stars shine brighter than usually, they mostly appear in groups. In some places, stars shine less bright | November to December |
| A 'halo' around the moon | Chikwa/ Nkhokwe | The moon is surrounded by circle. It also indicates a bumper harvest | August to January |
| Orion star | Nthanda | Star shines bright from around 2 AM to 4 AM | October to December |
| Redness of the sun | Dzuwa | When sun is going down, around 4 to 5 AM, the villagers see more redness in the sky. | October to December |
| Sun intensity | Not known | Increased intensity of sun shining | Not indicated |
| Full moon | Phanda | Big moon at night indicates rains, and it comes with stars. Also stars 'fall across each other' from west- east | October to December |
| Brightness of the moon | Not known | When the moon does not shine with usual brightness | January |
| Direction of moon rising | Not known | When moon rises from the south, it indicates good rainfall | Not indicated |

Appendix 7: List of early warning indicators documented during the main fieldwork

Appendix 7a: Animals

| English name | Chichewa Name | Behaviour | Period Observed |
|---------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Ants | Linthumbwi, Nyerere, Nthumbwi, Nsungununu | Increased number in houses and outside, affecting sleep. | July to December |
| Tortoise | Kambo | Increased numbers in the villages, they move from the marshes to the uplands | December |
| Hippopotamus | Mvuu | Moves away from the river and walks to the dry land. Floods will follow where the hippo goes, and it will not flood beyond the point hippo reached. | December to March |
| Pigeon | - | Making their nests pointing in a certain direction; the rains will come from the opposite direction. | November to December |
| Crickets | Nkhululu | Found in abundance in the farms; move from the farms to the villages; children dig them up; they will be a source of food. | October to December |
| Rats | Mbewa | They run from the fields, found in increased numbers and climb the trees. | October to December |
| Flies | Ntchentche | Increased numbers. | August to November |
| Chicken | - | Chicken lay eggs in higher places. | - |
| Mosquitoes | Udzuzu | Mosquitoes found in abundance; they bite a lot. | October to December |
| Army worms | Namakalaiti | Big worms found in the fields that eat up the leaves of crops. | December |
| Frogs | Chule, Lumbu, Tchonga | Found in abundance; producing a specific sound when jumping | Rainy season |
| Snails | Nkhono | Snails go up to the highest point of the trees | December |
| Mice | - | Found in increased numbers; they are eating up the leaves of the crops | April to July |
| Caterpillars | Masande | Found in increased numbers; they are eating up the leaves of the crops | September to October |
| Fish | Dambulu | Increased numbers with increasing volumes of waters in the village | December to March |
| Termites | Mphedza | They collect the maize and store it underground | September to December |
| Pangolin | Nkhaka | Found in the villages | - |
| Crocodiles | - | Moving away from the rivers to villages | December to March |
| Centipedes | - | More centipedes found around shovels in the farms | - |
| Birds | Akakowa | Migrate from farms into the village, the floods will reach the point where the birds have landed. | Closer to the flood event |
| | Janjo | Found in abundance; moving in groups; destroying crops | - |
| | Matsekwe | Found in abundance; they dig up crop fields | December |

| English name | Chichewa Name | Behaviour | Period Observed |
|--------------|--------------------|-------------------------------------------------------------------|-----------------|
| | Ng'ombe Ng'ombe | Produce a lot of sounds | December |
| | Tangwe | Produce a lot of sounds | - |
| | Nhkwazi | They come from the marshes to the villages and cover up the trees | - |
| | Chidokwe | It feeds on the fish from the rivers | - |

Appendix 7b: Plants

| English name | Chichewa name | Behaviour | Period Observed |
|-----------------------------|---------------|---------------------------------------------------------------|-----------------------|
| Trees | Nyenza | Increased number of fruits | October to November |
| | Bwemba | Increased number of fruits | August to December |
| | Mango | Increased number of fruits | May to December |
| | Mchulusuwa | Increased number of fruits | November to December |
| | Matondo | Increased number of fruits and it flowers a lot | October to December |
| | Ntondo | Increased number of fruits | June to December |
| | Mkina | Increased flowering | June to December |
| | Matherere | The flowers of the trees look 'faint' compared to other years | November to December |
| | Kaluweluwe | Increased flowering | August to September |
| | M'bona | Increased number of fruits | August to September |
| | Nkhunku | Increased flowering | October to November |
| | Mkina/ Lukina | Increased number of fruits | August to November |
| | Mdama | Production of bright flowers | - |
| | Mtowe | Increased number of fruits | September and October |
| | Mnjenya | Increased number of fruits | September to October |
| | Nyenje | Increased number of fruits | - |
| | Mfungo | Increased flowering | August to November |
| Pumpkin | - | Increased production | - |
| Water hyacinth plant | | Increased flowering | November to January |
| Bamboo | Bande | Plenty growing along the river banks | November to January |

Appendix 7c: Meteorological indicators

| Indicator | Chichewa name | description | Period observed |
|-----------------------|---------------|------------------------------------------------------------------------------------|-----------------------|
| Rain intensity | - | The amount of rainfall coming | Rainy season |
| Rain duration | - | Rainfall falling consecutively for days | Rainy season |
| Very hot temperatures | - | Too much heat | August to December |
| Heavy blowing of wind | - | Heavy winds blow followed by the clouds. | September to December |
| Rainfall patterns | - | Depending on whether the rains start too early or too late, where will be flooding | Rainy season |
| Whirlwinds | - | The whirlwinds will occur increasingly | September to December |
| Thunderstorms | - | Heavy thunderstorms indicating outbursts of rain | November |

Appendix 7d: Riverine indicators

| Indicator | Chichewa name | Description | Period observed |
|------------------------|---------------|-----------------------------------------------------------------|---------------------------|
| Rising of water levels | - | Water levels rising and reaching the farms | Shortly before the floods |
| Colours of water | - | Water is dirtier | October to January |
| Sounds of water | - | The villagers will begin to hear and increased sound of waters. | December to March |

Appendix 7e: Celestial indicators

| Indicator | Chichewa name | Description | Period Observed |
|------------------------|---------------|--------------------------------------------|---------------------|
| Too much Sun | - | There is too much Sun giving too much heat | Not indicated |
| 'Halo' around the moon | Chikwa | The moon is surrounded by a circle. | August to January |
| Orion star | Nthanda | It occurs in the skies. | October to January |
| Full moon | Phanda | Occurrence of the full moon. | October to December |

Appendix 7f: Phenomenological indicators

| Indicator | Chichewa name | Description | Period Observed |
|--------------------|---------------|-------------------------------------------------------------------------|-----------------------------------------|
| Pain in body parts | - | Elderly people will have pain in certain body parts (e.g. limbs, teeth) | Before the occurrence of heavy rainfall |
| Sweating | - | Increased sweating due to heat | |
| Troubles sleeping | - | People sleep outside since it is too warm in the inside | August to December |

REFERENCES

- van Aalst, M. K., Cannon, T., and Burton, I., 2008. Community level adaptation to climate change: The potential role of participatory community risk assessment. *Global Environmental Change*, 18 (1), 165–179.
- Abarquez, I. and Murshed, Z., 2004. *Community based disaster risk management: field practitioners handbook*. Bangkok, Thailand: Asian Disaster Preparedness Centre.
- Aboelela, S. W., Larson, E., Bakken, S., Carrasquillo, O., Formicola, A., Glied, S. A., Haas, J., and Gebbie, K. M., 2007. Defining Interdisciplinary Research: Conclusions from a Critical Review of the Literature. *Health Services Research*, 42 (1p1), 329–346.
- Acharya, A. and Poddar, P., 2016. *The River Itself Warns Us: Local Knowledge of Flood Forecasting in the Gandaki River Basin, West Champaran, India*. Kathmandu, Nepal: International Centre for Integrated Mountain Development.
- Acharya, A. and Prakash, A., 2019. When the river talks to its people: Local knowledge-based flood forecasting in Gandak River basin, India. *Environmental Development*, 31, 55–67.
- Adeloye, A. J., Mwale, F. D., and Dulanya, Z., 2015. A metric-based assessment of flood risk and vulnerability of rural communities in the Lower Shire Valley, Malawi. *Proceedings of the International Association of Hydrological Sciences*, 370, 139–145.
- Agrawal, A., 1995. Dismantling the Divide Between Indigenous and Scientific Knowledge. *Development and Change*, 26 (3), 413–439.
- Agrawal, A., 2005. The politics of indigenous knowledge. *Australian Academic and Research Libraries*, 36 (2), 71–81.
- Ajibade, I., McBean, G., and Bezner-Kerr, R., 2013. Urban flooding in Lagos, Nigeria: Patterns of vulnerability and resilience among women. *Global Environmental Change*, 23 (6), 1714–1725.
- Alcántara-Ayala, I., 2004. Flowing Mountains in Mexico. *Mountain Research and Development*, 24 (1), 10–13.
- Alexander, D., 2002. *Principles of emergency planning and management*. Edinburgh, United Kingdom: Terra Publishing.
- Allen, K. M., 2003. Vulnerability reduction and the community-based approach: A Philippines study. In: Pelling, M., ed. *Natural disasters and development in globalizing world*. London, UK: Routledge, 170–184.
- Allen, K. M., 2006. Community-based disaster preparedness and climate adaptation: local capacity-building in the Philippines. *Disasters*, 30 (1), 81–101.
- Anderson, M. B. and Woodrow, P. J., 1989. *Rising from the ashes: development strategies in times of disaster*. Boulder: Westview Press [u.a.].
- Antweiler, C., 2004. Local knowledge theory and methods: an urban model from Indonesia. In: Bicker, A., Sillitoe, P., and Pottier, J., eds. *Investigating local knowledge: New directions, new approaches*. ASHGATE.

- Arce, A. and Fisher, E., 2003. Knowledge interfaces and practice of negotiation: Cases from a women's group in Bolivia and an oil refinery in Wales. *In: Pottier, J., Bicker, A., and Sillitoe, P., eds. Negotiating local knowledge: power and identity in development.* London, UK: Pluto Press, 74–98.
- Arnold, M., 2012. International planning system for disaster. *In: Wisner, B., Gaillard, J. C., and Kelman, I., eds. The Routledge Handbook of Hazards and Disaster Risk Reduction.* Abington: Routledge, 603–616.
- Atkins, 2011. *Integrated flood risk management plan for the Shire Basin project: inception report*
- Audefroy, J. F. and Sánchez, B. N. C., 2017. Integrating local knowledge for climate change adaptation in Yucatán, Mexico. *International Journal of Sustainable Built Environment*, 6 (1), 228–237.
- Bacud, S. T., 2018. Integration of Indigenous and Scientific Knowledge in Disaster Risk Reduction: Resilience Building of a Marginalized Sampaguita Growing Community in the Philippines. *Procedia Engineering*, 212, 511–518.
- Bailey, J., 2008. First steps in qualitative data analysis: transcribing. *Family Practice*, 25 (2), 127–131.
- Balay-As, M., Marlowe, J., and Gaillard, J. C., 2018. Deconstructing the binary between indigenous and scientific knowledge in disaster risk reduction: Approaches to high impact weather hazards. *International Journal of Disaster Risk Reduction*, 30, 18–24.
- Balehegn, M., Balehey, S., Fu, C., and Liang, W., 2019. Indigenous weather and climate forecasting knowledge among Afar pastoralists of north eastern Ethiopia: Role in adaptation to weather and climate variability. *Pastoralism*, 9 (1), 8.
- Barber, M. and Bowie, C., 2008. How international NGOs could do less harm and more good. *Development in Practice*, 18 (6), 748–754.
- Barbier, E. B. and Hochard, J. P., 2016. Does Land Degradation Increase Poverty in Developing Countries? *PLOS ONE*, 11 (5), e0152973.
- Barrett, S., 2013. Local level climate justice? Adaptation finance and vulnerability reduction. *Global Environmental Change*, 23 (6), 1819–1829.
- Barriball, K. L. and While, A., 1994. Collecting data using a semi-structured interview: a discussion paper. *Journal of Advanced Nursing*, 19 (2), 328–335.
- Bazeley, P., 2013. *Qualitative Data Analysis: practical strategies.* London, UK: SAGE Publications.
- Benson, C., Twigg, J., and Myers, M., 2001. NGO Initiatives in Risk Reduction: An Overview. *Disasters*, 25 (3), 199–215.
- Berger, R., 2015. Now I see it, now I don't: researcher's position and reflexivity in qualitative research. *Qualitative Research*, 15 (2), 219–234.
- Berkes, F., 2009. Indigenous ways of knowing and the study of environmental change. *Journal of the Royal Society of New Zealand*, 39 (4), 151–156.

- Berkes, F. and Ross, H., 2013. Community Resilience: Toward an Integrated Approach. *Society & Natural Resources*, 26 (1), 5–20.
- Bickman, L. and Rog, D., 2009. Introduction: why a handbook of applied social research methods? In: Bickman, L. and Rog, D., eds. *The SAGE handbook of Applied social research methods*. London, UK: SAGE Publications.
- Birkmann, J., 2007. Risk and vulnerability indicators at different scales: Applicability, usefulness and policy implications. *Environmental Hazards*, 7 (1), 20–31.
- Birkmann, J., 2013. Measuring vulnerability to promote disaster-resilient societies and to enhance adaptation: Conceptual frameworks and definitions. In: Birkmann, J., ed. *Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies Second Edition*. Bonn, Germany: United Nations University Press.
- Bischiniotis, K., Hurk, B. van den, Jongman, B., Coughlan de Perez, E., Veldkamp, T., Moel, H. de, and Aerts, J., 2018. The influence of antecedent conditions on flood risk in sub-Saharan Africa. *Natural Hazards and Earth System Sciences*, 18 (1), 271–285.
- Blaikie, N., 2009. *Designing social research: the logic of anticipation*. 2nd ed. Cambridge, UK: Polity Press.
- Blaikie, P., Brown, K., Stocking, M., Tang, L., Dixon, P., and Sillitoe, P., 1997. Knowledge in action: Local knowledge as a development resource and barriers to its incorporation in natural resource research and development. *Agricultural Systems*, 55 (2), 217–237.
- Blaikie, P., Cannon, T., Davis, I., and Wisner, B., 1994. *At Risk: Natural Hazards, People's Vulnerability and Disasters*. 1st ed. London: Routledge.
- Blöschl, G., Gaál, L., Hall, J., Kiss, A., Komma, J., Nester, T., Parajka, J., Perdigão, R. A. P., Plavcová, L., Rogger, M., Salinas, J. L., and Viglione, A., 2015. Increasing river floods: fiction or reality? *Wiley Interdisciplinary Reviews: Water*, 2 (4), 329–344.
- Boillat, S. and Berkes, F., 2013. Perception and Interpretation of Climate Change among Quechua Farmers of Bolivia: Indigenous Knowledge as a Resource for Adaptive Capacity. *Ecology and Society*, 18 (4).
- Bollin, C. and Hidajat, R., 2013. Community- based risk index: Pilot implementation in Indonesia. In: Birkmann, J., ed. *Measuring vulnerability to natural hazards: Towards disaster resilient societies*. Bonn, Germany: United Nations University Press, 271–290.
- Botha, B., Nkoka, F., and Mwumvaneza, V., 2018. *Hard hit by El Nino: experiences, responses and options for Malawi*. Washington, DC: World Bank Group.
- Bowen, G. A., 2009. Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*.
- Bowman, L. and White, P., 2012. ‘Community’ perceptions of a disaster risk reduction intervention at Santa Ana (Ilamatepec) Volcano, El Salvador. *Environmental Hazards*, 11 (2), 138–154.

- Bradley, E. H., Curry, L. A., and Devers, K. J., 2007. Qualitative Data Analysis for Health Services Research: Developing Taxonomy, Themes, and Theory. *Health Services Research*, 42 (4), 1758–1772.
- Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3 (2), 77–101.
- Briggs, J., 2005. The use of indigenous knowledge in development: problems and challenges. *Progress in Development Studies*, 5 (2), 99–114.
- Briggs, J., 2013. Indigenous knowledge: A false dawn for development theory and practice? *Progress in Development Studies*, 13 (3), 231–243.
- Briggs, J. and Sharp, J., 2004. Indigenous knowledges and development: a postcolonial caution. *Third World Quarterly*, 25 (4), 661–676.
- Briggs, J., Sharp, J., Yacoub, H., Hamed, N., and Roe, A., 2007. The nature of indigenous environmental knowledge production: evidence from Bedouin communities in southern Egypt. *Journal of International Development*, 19 (2), 239–251.
- Bright, C., Tumbare, M., Nyabaze, W., and Nhapi, I., 2014. Validation of local knowledge drought forecasting systems in the Limpopo River Basin in Southern Africa. *Disaster Prevention and Management: An International Journal*, 23 (5), 551–566.
- Brokensha, D., Warren, D. M., and Werner, O., 1980. *Indigenous knowledge systems and development*. Lanham, MD: University Press of America.
- Brooks, N., 2003. *Vulnerability, risk and adaptation: A conceptual framework (Tyndall Centre Working Paper No.38)*. Norwich, United Kingdom: Tyndall Centre for Climate Change Research.
- Brown, D., 2011. Making the linkages between climate change adaptation and spatial planning in Malawi. *Environmental Science & Policy*, 14 (8), 940–949.
- Bryman, A., 2012. *Social research methods*. 4th ed. Oxford, UK: Oxford Univ. Press.
- Bryman, A. and Bell, E., 2015. *Business research methods*. 4th ed. Oxford, UK: Oxford Univ. Press.
- Buckle, P., 2012. Preparedness, warning and evacuation. In: Wisner, B., Gaillard, J. C., and Kelman, I., eds. *The Routledge Handbook of Hazards and Disaster Risk Reduction*. Abingdon: Routledge, 481–492.
- Cadag, J. R. D. and Gaillard, J. C., 2012. Integrating knowledge and actions in disaster risk reduction: the contribution of participatory mapping. *Area*, 44 (1), 100–109.
- Cammack, D., 2011. Local Governance and Public Goods in Malawi. *IDS Bulletin*, 42 (2), 43–52.
- Cannon, T., 1994. Vulnerability analysis and the explanation of ‘natural’ disaster. In: Varley, A., ed. *Disasters, Development and Environment*. Chichester: J. Wiley & Sons.
- Cannon, T., 2000. Vulnerability analysis and disasters. In: Parker, D. ., ed. *Floods*. London, UK: Routledge, 45–55.

- Cannon, T., 2008. Vulnerability, “innocent” disasters and the imperative of cultural understanding. *Disaster Prevention and Management: An International Journal*, 17 (3), 350–357.
- Cannon, T. and Müller-Mahn, D., 2010. Vulnerability, resilience and development discourses in context of climate change. *Natural Hazards*, 55 (3), 621–635.
- Cannon, T., Twigg, J., and Rowell, J., 2003. *Social Vulnerability, Sustainable Livelihoods and Disasters*. United Kingdom: Department for International Development (DFID).
- Carby, B., 2015. Beyond the community: integrating local and scientific knowledge in the formal development approval process in Jamaica. *Environmental Hazards*, 14 (3), 252–269.
- CARE International, 2018. *The Enhancing Community Resilience Programme: 2011-2017: Final Evaluation Summary* [online]. CARE International. Available from: <http://careevaluations.org/wp-content/uploads/The-Enhancing-Community-Resilience-Program.pdf>.
- Chambers, R., 1994. The origins and practice of participatory rural appraisal. *World Development*, 22 (7), 953–969.
- Chambers, R., 2007. *From PRA to PLA and pluralism : practice and theory*. Brighton, UK: Institute for Development Studies.
- Chambers, R. and Conway, G., 1991. *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. Brighton, UK: Institute for Development Studies. No. IDS Discussion Paper 296.
- Charmaz, K., 2014. *Constructing grounded theory*. 2nd ed. London, UK: SAGE Publications.
- Chavula, G., 2013. *A report on local indigenous knowledge systems and practices (LIKSP) in Malawi*. Global Water Partnership- Southern Africa.
- Chawawa, N., 2018. Why do smallholder farmers insist on living in flood prone areas? Understanding self-perceived vulnerability and dynamics of local adaptation in Malawi. PhD Thesis. University of Edinburgh, Edinburgh, United Kingdom.
- Chidanti-Malunga, J., 2011. Adaptive strategies to climate change in Southern Malawi. *Physics and Chemistry of the Earth, Parts A/B/C*, 36 (14), 1043–1046.
- Chikwawa District Council, 2014. *Disaster Contingency Plan 2014-2015*. Chikwawa, Malawi: Government of Malawi.
- Chikwawa District Council, 2017. *Chikwawa socio-economic profile*. Chikwawa, Malawi: Government of Malawi.
- Chiotha, S., Kamlongera, C., Kossam, F., Maliwichi-Nyirenda, C., Mphepo, G., Phalira, W., and Pullanikkatil, D., 2011. *Scientific validation of traditional early warning signals for floods and droughts in Nsanje and Chikwawa districts, Malawi*. Zomba, Malawi: LEAD SEA.

Chiotha, S., Tembo-Nhlema, D., Kachiwanda, Y., Kamanga, T. ., Kossam, F., and Mtonya, A., 2016. *Strengthening Early Warning in Malawi*. Zomba Malawi: LEAD SEA.

Chiusiwa, J., 2015. *Malawi: National progress report on the implementation of the Hyogo framework of action (2013–2015)* [online]. Lilongwe, Malawi: Department of Disaster Management Affairs. Available from: <https://www.preventionweb.net/english/hyogo/progress/reports/v.php?id=41874&pid:223>.

Chowdhoree, I., 2019. Indigenous knowledge for enhancing community resilience: An experience from the south-western coastal region of Bangladesh. *International Journal of Disaster Risk Reduction*, 40, 101259.

Chowns, E., 2014. The political economy of community management: a study of factors influencing sustainability in Malawi's rural water supply sector. PhD Thesis. University of Birmingham, Birmingham, United Kingdom.

Clarke Guarnizo, C., 1992. Living with hazards: communities' adjustment mechanisms in developing countries. In: Kreimer, A. and Munasinghe, M., ed. *Environmental Management and Urban Vulnerability*. Washington DC, USA: World Bank Group. 93–102.

Cohen, P. J., Lawless, S., Dyer, M., Morgan, M., Saeni, E., Teioli, H., and Kantor, P., 2016. Understanding adaptive capacity and capacity to innovate in social–ecological systems: Applying a gender lens. *Ambio*, 45 (3), 309–321.

Coles, A. R. and Quintero-Angel, M., 2018. From silence to resilience: prospects and limitations for incorporating non-expert knowledge into hazard management. *Environmental Hazards*, 17 (2), 128–145.

Connolly-Boutin, L. and Smit, B., 2016. Climate change, food security, and livelihoods in sub-Saharan Africa. *Regional Environmental Change*, 16 (2), 385–399.

Cook, B., 2015. Disaster management culture in Bangladesh: the enrolment of local knowledge by decision makers. In: Krüger, F., Bankoff, G., Cannon, T., Orłowski, B., and Schipper, E. L. F., eds. *Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction*. London, UK: Routledge, 191–207.

Coppola, D. P., 2011. *Introduction to international disaster management*. 2nd ed. Elsevier.

Cornwall, A., 2008. Unpacking 'Participation': models, meanings and practices. *Community Development Journal*, 43 (3), 269–283.

Coyne, I. T., 1997. Sampling in qualitative research. Purposeful and theoretical sampling; merging or clear boundaries? *Journal of Advanced Nursing*, 26 (3), 623–630.

Creswell, J., 1994. *Research design: qualitative and quantitative approaches*. London, UK: SAGE Publications.

Creswell, J., 2013. *Qualitative inquiry and research design: choosing among five approaches*. 3rd ed. London, UK: SAGE Publications.

- Creswell, J. and Creswell, D., 2018. *Research design: qualitative, quantitative and mixed methods approaches*. 5th ed. London, UK: SAGE Publications.
- Cretney, R. M., 2016. Local responses to disaster. *Disaster Prevention and Management*, 25 (1), 27–40.
- Cronin, S. J., Gaylord, D. R., Charley, D., Alloway, B. V., Wallez, S., and Esau, J. W., 2004. Participatory methods of incorporating scientific with traditional knowledge for volcanic hazard management on Ambae Island, Vanuatu. *Bulletin of Volcanology*, 66 (7), 652–668.
- Crotty, M., 1998. *The foundation of social research: meaning and perspectives in the research process*. London, UK: SAGE Publications.
- Cuny, F. C., 1991. Living with floods: alternatives for riverine flood mitigation. *Land Use Policy*, 8 (4), 331–342.
- Cutter, S. L., Boruff, B., and Shirley, W., 2003. Social Vulnerability to Environmental Hazards. *Social Science Quarterly*, 84 (2), 242–261.
- Davis, I., Haghebaert, B., and Peppiatt, D., 2004. *Social Vulnerability and Capacity Analysis: discussion paper and workshop report*. Geneva, Switzerland: ProVention Consortium.
- Davis, I. and Murshed, Z., 2006. *Critical guidelines: community based disaster risk management*. Bangkok, Thailand: Asian Disaster Preparedness Centre.
- Dekens, J., 2007. *Local knowledge for disaster preparedness: a literature review*. Kathmandu, Nepal: International Centre for Integrated Mountain Development.
- Dekens, J., 2009. Local knowledge on flood preparedness in Eastern Terai of Nepal. In: Shaw, R., Sharma, A., and Takeuchi, Y., eds. *Indigenous Knowledge and Disaster Risk Reduction: From Practice to Policy*. New York City: Nova Science Publishers, 148–166.
- Delica-Willison, Z. and Gaillard, J. C., 2012. Community action and disaster. In: Wisner, B., Gaillard, J. C., and Kelman, I., eds. *The Routledge Handbook of Hazards and Disaster Risk Reduction*. London, UK: Routledge, 711–723.
- Demeritt, D., Cloke, H., Pappenberger, F., Thielen, J., Bartholmes, J., and Ramos, M.-H., 2007. Ensemble predictions and perceptions of risk, uncertainty, and error in flood forecasting. *Environmental Hazards*, 7 (2), 115–127.
- Devereux, S., 2007. The impact of droughts and floods on food security and policy options to alleviate negative effects. *Agricultural Economics*, 37 (s1), 47–58.
- DFID, 1999. Sustainable Livelihoods Guidance Notes. [online]. Available from: <https://www.ennonline.net/dfidsustainableliving>.
- Diener, E. and Crandall, R., 1978. *Ethics in social and behavioural research*. Chicago, USA: University of Chicago Press.
- Djalante, R. and Thomalla, F., 2012. Disaster risk reduction and climate change adaptation in Indonesia: Institutional challenges and opportunities for integration. *International Journal of Disaster Resilience in the Built Environment*, 3 (2), 166–180.

- DoDMA, 2015a. *Malawi hazards and vulnerability atlas*. Lilongwe, Malawi: Department of Disaster Management Affairs.
- DoDMA, 2015b. *Decentralised early warning systems in Malawi*. Lilongwe, Malawi: Department of Disaster Management Affairs.
- Dow, K., Berkhout, F., Preston, B. L., Klein, R. J. T., Midgley, G., and Shaw, M. R., 2013. Limits to adaptation. *Nature Climate Change*, 3, 305–307.
- Dube, E. and Munsaka, E., 2018. The contribution of indigenous knowledge to disaster risk reduction activities in Zimbabwe: A big call to practitioners. *Jàmbá: Journal of Disaster Risk Studies*, 10 (1), 8.
- Dumaru, P., 2010. Community-based adaptation: enhancing community adaptive capacity in Druadrua Island, Fiji. *Wiley Interdisciplinary Reviews: Climate Change*, 1 (5), 751–763.
- Dunn, K., 2010. Interviewing. In: Hay, I., ed. *Qualitative research methods in human geography*. Oxford, UK: Oxford University Press, 101–138.
- Duraiappah, A. K., 1998. Poverty and environmental degradation: A review and analysis of the nexus. *World Development*, 26 (12), 2169–2179.
- Fabiyi, O. O. and Oloukoi, J., 2013. Indigenous Knowledge System and Local Adaptation Strategies to Flooding in Coastal Rural Communities of Nigeria. *Journal of Indigenous Social Development*, 2, 1–19.
- Fauchereau, N., Trzaska, S., Richard, Y., Roucou, P., and Camberlin, P., 2003. Sea-surface temperature co-variability in the Southern Atlantic and Indian Oceans and its connections with the atmospheric circulation in the Southern Hemisphere. *International Journal of Climatology*, 23 (6), 663–677.
- Ferdinand, I., O'Brien, G., O'Keefe, P., and Jayawickrama, J., 2012. The double bind of poverty and community disaster risk reduction: A case study from the Caribbean. *International Journal of Disaster Risk Reduction*, 2, 84–94.
- Fernando, J. L., 2003. NGOs and Production of Indigenous Knowledge Under the Condition of Postmodernity. *The ANNALS of the American Academy of Political and Social Science*, 590 (1), 54–72.
- Few, R., 2003. Flooding, vulnerability and coping strategies: local responses to a global threat. *Progress in Development Studies*, 3 (1), 43–58.
- Finlay, L., 2002. Negotiating the swamp: the opportunity and challenge of reflexivity in research practice. *Qualitative Research*, 2 (2), 209–230.
- Flavier, J. M., de Jesus, A., and Navarro, C., 1995. The regional program for the promotion of indigenous knowledge in Asia. In: Warren, D. M., Slikkerveer, L. J., Brokensha, D., and Dechering, W. H. J. C., eds. *The Cultural Dimension of Development: Indigenous knowledge systems*. Rugby, Warwickshire, United Kingdom: Practical Action Publishing.
- Flick, U., 2018. *An Introduction to Qualitative Research*. 6th ed. London, UK: SAGE Publications.

- Flores-Fernandez, R., 2011. Physical and Spatial Characteristics of Slum Territories Vulnerable to Natural Disasters. *In: Slum upgrading programmes in Nairobi: challenges in implementation*. Nairobi: IFRA, 16.
- Flyvbjerg, B., 2006. Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12 (2), 219–245.
- Fordham, M., 2007. Social vulnerability and capacity. *Natural Hazards Observer*, XXXII (2).
- Fordham, M., 2011. *Gender, Sexuality and Disaster*. London, United Kingdom: Routledge Handbooks Online.
- Forrest, S., Trell, E.-M., and Woltjer, J., 2018. Civil society contributions to local level flood resilience: Before, during and after the 2015 Boxing Day floods in the Upper Calder Valley. *Transactions of the Institute of British Geographers*.
- Forsyth, T., 2013. Community-based adaptation: a review of past and future challenges. *Wiley Interdisciplinary Reviews: Climate Change*, 4 (5), 439–446.
- Fothergill, A. and Peek, L. A., 2004. Poverty and Disasters in the United States: A Review of Recent Sociological Findings. *Natural Hazards*, 32 (1), 89–110.
- Frazier, K., 1979. *The Violent Face of Nature: Severe Phenomena and Natural Disasters*. Morrow.
- Freeman, C., Nairn, K., and Gollop, M., 2015. Disaster impact and recovery: what children and young people can tell us. *Kōtuitui: New Zealand Journal of Social Sciences Online*, 10 (2), 103–115.
- Furedi, F., 2007. The changing meaning of disaster. *Area*, 39 (4), 482–489.
- Gaillard, J. C., 2010. Vulnerability, capacity and resilience: Perspectives for climate and development policy. *Journal of International Development*, 22 (2), 218–232.
- Gaillard, J. C., 2015. Vulnerability and Livelihoods. *In: Gaillard, J. C., ed. People's Response to Disasters in the Philippines: Vulnerability, Capacities, and Resilience*. New York: Palgrave Macmillan US, 57–66.
- Gaillard, J. C., 2019. Disaster studies inside out. *Disasters*, 43 (S1), S7–S17.
- Gaillard, J. C., Cadag, J. R. D., and Rampengan, M. M. F., 2019. People's capacities in facing hazards and disasters: an overview. *Natural Hazards*, 95 (3), 863–876.
- Gaillard, J. C., Cadag, J. R., Gampell, A., Hore, K., Dé, L. L., and McSherry, A., 2016. Participatory numbers for integrating knowledge and actions in development. *Development in Practice*, 26 (8), 998–1012.
- Gaillard, J. C., Gorman-Murray, A., and Fordham, M., 2017. Sexual and gender minorities in disasters. *Gender, Place and Culture*, 24 (1), 18–26.
- Gaillard, J. C. and Mercer, J., 2013. From knowledge to action: Bridging gaps in disaster risk reduction. *Progress in Human Geography*, 37 (1), 93–114.

Gaillard, J.-C., Clavé, E., Vibert, O., Azhari, Dedi, Denain, J.-C., Efendi, Y., Grancher, D., Liamzon, C. C., Sari, D. R., and Setiawan, R., 2008. Ethnic groups' response to the 26 December 2004 earthquake and tsunami in Aceh, Indonesia. *Natural Hazards*, 47 (1), 17–38.

Gallopín, G. C., 2006. Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change*, 16 (3), 293–303.

Galvin, R., 2015. How many interviews are enough? Do qualitative interviews in building energy consumption research produce reliable knowledge? *Journal of Building Engineering*, 1, 2–12.

Gaume, E., Bain, V., Bernardara, P., Newinger, O., Barbuc, M., Bateman, A., Blaškovičová, L., Blöschl, G., Borga, M., Dumitrescu, A., Daliakopoulos, I., Garcia, J., Irimescu, A., Kohnova, S., Koutroulis, A., Marchi, L., Matreata, S., Medina, V., Preciso, E., Sempere-Torres, D., Stancalie, G., Szolgay, J., Tsanis, I., Velasco, D., and Viglione, A., 2009. A compilation of data on European flash floods. *Journal of Hydrology*, 367 (1), 70–78.

Gaynor, N., 2010. Between Citizenship and Clientship: The Politics of Participatory Governance in Malawi. *Journal of Southern African Studies*, 36 (4), 801–816.

Gero, A., Méheux, K., and Dominey-Howes, D., 2011. Integrating community based disaster risk reduction and climate change adaptation: examples from the Pacific. *Natural Hazards and Earth System Sciences*, 11 (1), 101–113.

GFDRR, 2019. *Disaster Risk Profile: Malawi* [online]. Washington, DC: World Bank Group. Available from: https://reliefweb.int/sites/reliefweb.int/files/resources/malawi_low.pdf. [Accessed 10 Jul 2019].

Gómez-Baggethun, E., Reyes-García, V., Olsson, P., and Montes, C., 2012. Traditional ecological knowledge and community resilience to environmental extremes: A case study in Doñana, SW Spain. *Global Environmental Change*, 22 (3), 640–650.

Gomm, R., 2004. *Social research methodology: a critical introduction*. Houndmills, UK: Palgrave Macmillan.

Gomo, F. F., Macleod, C., Rowan, J., Yeluripati, J., and Topp, K., 2018. Supporting better decisions across the nexus of water, energy and food through earth observation data: case of the Zambezi basin. In: *Proceedings of the International Association of Hydrological Sciences*. Presented at the IAHS Scientific Assembly 2017, Port Elizabeth, South Africa,

Gorman-Murray, A., McKinnon, S., Dominey-Howes, D., Nash, C. J., and Bolton, R., 2018. Listening and learning: giving voice to trans experiences of disasters. *Gender, Place & Culture*, 25 (2), 166–187.

Government of Malawi, 1991. *The disaster preparedness and relief act*. Lilongwe, Malawi.

Government of Malawi, 1998a. *Local government act*. Lilongwe, Malawi.

Government of Malawi, 1998b. *Malawi decentralisation policy*. Lilongwe, Malawi.

- Government of Malawi, 2004. *National Environmental Policy*. Lilongwe, Malawi.
- Government of Malawi, 2006a. *Malawi Growth and Development Strategy 2006-2011*. Lilongwe, Malawi.
- Government of Malawi, 2006b. *Malawi National Adaptation Programme of Action*. Lilongwe, Malawi.
- Government of Malawi, 2009. *Operational guidelines for disaster risk management*. Lilongwe, Malawi.
- Government of Malawi, 2011. *Malawi Growth and Development Strategy II 2011-2016*. Lilongwe, Malawi.
- Government of Malawi, 2014. *National disaster risk management communication strategy*. Lilongwe, Malawi.
- Government of Malawi, 2015a. *Malawi 2015 Floods Post Disaster Needs Assessment Report*. Lilongwe, Malawi.
- Government of Malawi, 2015b. *Disaster Risk Management Act*. Lilongwe, Malawi.
- Government of Malawi, 2015c. *National disaster risk management policy*. Lilongwe, Malawi.
- Government of Malawi, 2015d. *National disaster risk management policy: implementation, monitoring and evaluation strategy*. Lilongwe, Malawi.
- Government of Malawi, 2016a. *National Climate Change Policy*. Lilongwe, Malawi.
- Government of Malawi, 2016b. *Implementation, monitoring and evaluation strategy for National climate change management policy*. Lilongwe, Malawi.
- Government of Malawi, 2016c. *Malawi flood emergency recovery project*. Lilongwe, Malawi.
- Government of Malawi, 2017. *Malawi Growth Development Strategy (MGDS III) 2017-2022*. Lilongwe, Malawi.
- Government of Malawi, 2019. *Malawi 2019 Floods Post Disaster Needs Assessment Report*. Lilongwe, Malawi.
- Grady, A., Gersonius, B., and Makarigakis, A., 2016. Taking stock of decentralized disaster risk reduction in Indonesia. *Natural Hazards and Earth System Sciences*, 16 (9), 2145–2157.
- Gratani, M., Butler, J., Royee, F., Valentine, P., Burrows, D., Canendo, W., and Anderson, A., 2011. Is Validation of Indigenous Ecological Knowledge a Disrespectful Process? A Case Study of Traditional Fishing Poisons and Invasive Fish Management from the Wet Tropics, Australia. *Ecology and Society*, 16 (3):25.
- Gray, D., 2018. *Doing research in the real world*. 4th ed. London, UK: SAGE Publications.

- Green, D., Billy, J., and Tapim, A., 2010. Indigenous Australians' knowledge of weather and climate. *Climatic Change*, 100 (2), 337–354.
- Guba, E. . and Lincoln, Y. ., 1994. Competing paradigms in qualitative research. In: Denzin, N. . and Lincoln, Y. ., eds. *Handbook of qualitative research*. London, UK: SAGE Publications, 105–117.
- Guest, G., Bunce, A., and Johnson, L., 2006. How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. *Field Methods*, 18 (1), 59–82.
- Guest, G., Namey, E., and McKenna, K., 2017. How Many Focus Groups Are Enough? Building an Evidence Base for Nonprobability Sample Sizes. *Field Methods*, 29 (1), 3–22.
- Gwimbi, P., 2009. Linking rural community livelihoods to resilience building in flood risk reduction in Zimbabwe. *Jambá: Journal of Disaster Risk Studies*, 2 (1), 80–89.
- Hajat, A. and Mussa, D., n.d. *Indigenous knowledge and climate change adaptation: a compedium of early warning signs and adaptation mechanisms*. Lilongwe, Malawi: Cooperazione Internazionale.
- Halcomb, E. J., Gholizadeh, L., DiGiacomo, M., Phillips, J., and Davidson, P. M., 2007. Literature review: considerations in undertaking focus group research with culturally and linguistically diverse groups. *Journal of Clinical Nursing*, 16 (6), 1000–1011.
- Hallegatte, S., Vogt-Schilb, A., Bangalore, M., and Rozenberg, J., 2016. *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters*. Washington DC, USA: The World Bank.
- Haque, M., 2019. Indigenous Knowledge and Practices in Disaster Management: Experiences of the Coastal People of Bangladesh. In: Zutshi, B., Ahmad, A., and Srungarapati, A. B., eds. *Disaster Risk Reduction: Community Resilience and Responses*. Singapore: Springer Singapore, 59–72.
- Harries, T. and Penning-Rowsell, E., 2011. Victim pressure, institutional inertia and climate change adaptation: The case of flood risk. *Global Environmental Change*, 21 (1), 188–197.
- Harvey, B., Cochrane, L., and Epp, M. V., 2019. Charting knowledge co-production pathways in climate and development. *Environmental Policy and Governance*, 29 (2), 107–117.
- Harvey, F., 2019. One climate crisis disaster happening every week, UN warns. *The Guardian* [online], 2019. Available from: https://www.theguardian.com/environment/2019/jul/07/one-climate-crisis-disaster-happening-every-week-un-warns?CMP=fb_gu&utm_medium=Social&utm_source=Facebook#Echobox=1562502767 [Accessed 25 Jul 2019].
- Heijmans, A., 2004. From Vulnerability to Empowerment. In: Bankoff, G., Frerks, G., and Hilhorst, D., eds. *Mapping Vulnerability: Disasters, Development and People*. London, UK: Earthscan.

Heijmans, A., 2009. *The social life of community-based disaster risk reduction: origin, politics and framing (Disaster Studies Working Paper 20)*. London, UK: University College London.

Heijmans, A., 2012. Risky encounters: institutions and interventions in response to recurrent disasters and conflicts. PhD Thesis. Wageningen University, Wageningen, The Netherlands.

Helgeson, J., Dietz, S., and Hochrainer, S., 2012. *Vulnerability to Weather Disasters: The Choice of Coping Strategies in Rural Uganda*. Rochester, NY: Social Science Research Network. SSRN Scholarly Paper No. ID 2191965.

Hendry, A., Haigh, I. D., Nicholls, R. J., Winter, H., Neal, R., Wahl, T., Joly-Laugel, A., and Darby, S. E., 2019. Assessing the characteristics and drivers of compound flooding events around the UK coast. *Hydrology and Earth System Sciences*, 23 (7), 3117–3139.

Hettiarachchi, S., Wasko, C., and Sharma, A., 2019. Can antecedent moisture conditions modulate the increase in flood risk due to climate change in urban catchments? *Journal of Hydrology*, 571, 11–20.

Hilhorst, D., Baart, J., van den Haar, G., and Leeftink, F. ., 2015. Is disaster “normal” for indigenous people? Indigenous knowledge and coping practices. *Disaster Prevention and Management: An International Journal*, 24 (4), 506–522.

Hiwasaki, L., 2017. Local knowledge for disaster risk reduction including climate change adaptation. In: Kelman, I., Mercer, J., and Gaillard, J. C., eds. *The Routledge Handbook of Disaster Risk Reduction Including Climate Change Adaptation*. London, UK: Routledge, 227–237.

Hiwasaki, L., Luna, E., Syamsidik, and Shaw, R., 2014a. Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities. *International Journal of Disaster Risk Reduction*, 10, 15–27.

Hiwasaki, L., Luna, E., Syamsidik, and Shaw, R., 2014b. *Local and indigenous knowledge for community resilience: hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities*. Jakarta: UNESCO.

van den Homberg, M. and McQuistan, C., 2019. Technology for Climate Justice: A Reporting Framework for Loss and Damage as Part of Key Global Agreements. In: Mechler, R., Bouwer, L. M., Schinko, T., Surminski, S., and Linnerooth-Bayer, J., eds. *Loss and Damage from Climate Change: Concepts, Methods and Policy Options*. Cham: Springer International Publishing, 513–545.

Hooli, L. J., 2016. Resilience of the poorest: coping strategies and indigenous knowledge of living with the floods in Northern Namibia. *Regional Environmental Change*, 16 (3), 695–707.

Howell, P., 2003. *Indigenous early warning indicators of cyclones: potential application in coastal Bangladesh*. London, UK: Benfield Greig Hazard Research Centre.

IDNDR, 1994. *Yokahoma strategy and plan for action for a safer world*. Yokahoma, Japan: United Nations.

- Iloka, N. G., 2016. Indigenous knowledge for disaster risk reduction: An African perspective. *Jàmbá: Journal of Disaster Risk Studies*, 8 (1), 272.
- International Monetary Fund, 2018. *World Economic Outlook: Challenges to steady growth* [online]. Washington, DC: International Monetary Fund. Available from: <https://www.imf.org/external/datamapper/datasets/WEO>. [Accessed 17 Feb 2019]
- IPCC, 2012. *Managing the risks of extreme events and disasters to advance climate change adaptation*. Cambridge, UK: Cambridge University Press.
- IPCC, 2018. *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. Geneva, Switzerland: International Panel on Climate Change.
- Irfanullah, H. and Motaleb, M. A., 2011. Reading Nature's Mind: Disaster management by indigenous peoples of Bangladesh. *Indian Journal of Traditional Knowledge*, 10 (1), 80–90.
- Ishiwatari, M., 2012. Chapter 2 Government Roles in Community-Based Disaster Risk Reduction. In: Shaw, R., ed. *Community-Based Disaster Risk Reduction*. Emerald Group Publishing Limited, 19–33.
- Islam, M. R., Ingham, V., Hicks, J., and Kelly, E., 2018. From coping to adaptation: Flooding and the role of local knowledge in Bangladesh. *International Journal of Disaster Risk Reduction*, 28, 531–538.
- Iticha, B. and Husen, A., 2019. Adaptation to climate change using indigenous weather forecasting systems in Borana pastoralists of southern Ethiopia. *Climate and Development*, 11 (7), 564–573.
- Izumi, T. and Shaw, R., 2012. Role of NGOs in Community-Based Disaster Risk Reduction. In: Shaw, R., ed. *Community-based disaster risk reduction*. Bingley, UK: Emerald Group Publishing Limited, 35–54.
- Izumi, T., Shaw, R., Djalante, R., Ishiwatari, M., and Komino, T., 2019. Disaster risk reduction and innovations. *Progress in Disaster Science*, 100033.
- Jackson, D., 2011. *Effective financial mechanisms and the national and local level for disaster risk reduction: paper written for the mid terms review of the UNISDR Hyogo Framework for Action*. Bangkok, Thailand: UNISDR Asia and Pacific Office.
- Jacobi, J., Mathez-Stiefel, S.-L., Gambon, H., Rist, S., and Altieri, M., 2017. Whose Knowledge, Whose Development? Use and Role of Local and External Knowledge in Agroforestry Projects in Bolivia. *Environmental Management*, 59 (3), 464–476.
- Jahangiri, K., Izadkhah, Y. O., and Tabibi, S. J., 2011. A comparative study on community-based disaster management in selected countries and designing a model for Iran. *Disaster Prevention and Management: An International Journal*. 20(1), 82.94
- Jon, I., 2019. Resilience and 'technicity': challenges and opportunities for new knowledge practices in disaster planning. *Resilience*, 7 (2), 107–125.

- Jones, S., Manyena, B., and Walsh, S., 2015. Chapter 4 - Disaster Risk Governance: Evolution and Influences. *In: Shroder, J. F., Collins, A. E., Jones, S., Manyena, B., and Jayawickrama, J., eds. Hazards, Risks and Disasters in Society*. Boston: Academic Press, 45–61.
- Jones, S., Oven, K. J., Manyena, B., and Aryal, K., 2014. Governance struggles and policy processes in disaster risk reduction: A case study from Nepal. *Geoforum*, 57, 78–90.
- Jongman, B., 2018. Effective adaptation to rising flood risk. *Nature Communications*, 9 (1), 1986.
- Joshua, M. K., Ngongondo, C., Monjerezi, M., Chipungu, F., and Malidadi, C., 2017. Relevance of indigenous knowledge in weather and climate forecasting for agricultural adaptation to climate variability and change in Malawi. *In: Mafongoya, P. . and Ajayi, O. C., eds. Indigenous knowledge and climate change management in Africa*. The Technical Centre for Agricultural and Rural Cooperation, 185–217.
- Jury, M. R., 2014. Malawi's Shire River Fluctuations and Climate. *Journal of Hydrometeorology*, 15(5), 2039–2049.
- Kagunyu, A., Wandibba, S., and Wanjohi, J. G., 2016. The use of indigenous climate forecasting methods by the pastoralists of Northern Kenya. *Pastoralism*, 6 (1), 7.
- Kamara, J. K., Agho, K., and Renzaho, A. M. N., 2019. Understanding disaster resilience in communities affected by recurrent drought in Lesotho and Swaziland—A qualitative study. *PLOS ONE*, 14 (3), e0212994.
- Karnieli-Miller, O., Strier, R., and Pessach, L., 2009. Power Relations in Qualitative Research. *Qualitative Health Research*, 19 (2), 279–289.
- Kayuni, H. M. and Tambulasi, R. I. C., 2011. Thriving on the Edge of Chaos: An Alternative Explanation to the Management of Crisis in Malawi's Decentralization Program. *International Journal of Public Administration*, 34 (12), 800–814.
- Keating, A., Campbell, K., Mechler, R., Magnuszewski, P., Mochizuki, J., Liu, W., Szoenyi, M., and McQuistan, C., 2017. Disaster resilience: what it is and how it can engender a meaningful change in development policy. *Development Policy Review*, 35 (1), 65–91.
- Keating, A., Campbell, K., Szoenyi, M., McQuistan, C., Nash, D., and Burer, M., 2017. Development and testing of a community flood resilience measurement tool. *Natural Hazards and Earth System Sciences*, 17 (1), 77–101.
- Kellet, J. and Caravani, A., 2013. *Financing disaster risk reduction: a 20 year story of international aid*. London, UK: Overseas Development Institute.
- Kelman, I., 2018. Lost for Words Amongst Disaster Risk Science Vocabulary? *International Journal of Disaster Risk Science*, 9 (3), 281–291.
- Kelman, I., Gaillard, J. C., Lewis, J., and Mercer, J., 2016. Learning from the history of disaster vulnerability and resilience research and practice for climate change. *Natural Hazards*, 82 (1), 129–143.

- Kelman, I. and Mather, T. A., 2008. Living with volcanoes: The sustainable livelihoods approach for volcano-related opportunities. *Journal of Volcanology and Geothermal Research*, 172 (3), 189–198.
- Kelman, I., Mercer, J., and Gaillard, J., 2012. Indigenous knowledge and disaster risk reduction. *Geography*, 97 (1), 12–21.
- Kenney, C. M. and Phibbs, S., 2015. A Māori love story: Community-led disaster management in response to the Ōtautahi (Christchurch) earthquakes as a framework for action. *International Journal of Disaster Risk Reduction*, 14, 46–55.
- Kerr, R. B., Nyantakyi-Frimpong, H., Dakishoni, L., Lupafya, E., Shumba, L., Luginaah, I., and Snapp, S. S., 2018. Knowledge politics in participatory climate change adaptation research on agroecology in Malawi. *Renewable Agriculture and Food Systems*, 33 (3), 238–251.
- Kettle, N. P., Dow, K., Tuler, S., Webler, T., Whitehead, J., and Miller, K. M., 2014. Integrating scientific and local knowledge to inform risk-based management approaches for climate adaptation. *Climate Risk Management*, 4–5, 17–31.
- Kienberger, S., 2013. Mapping vulnerability- integration of GIScience and participatory approaches at the local and district levels. In: Birkmann, J., ed. *Measuring vulnerability to natural hazards: towards disaster resilient societies*. 2. ed. Bonn, Germany: United Nations University Press, 401–422.
- Kishindo, P., 2004. Customary land tenure and the new land policy in Malawi. *Journal of Contemporary African Studies*, 22 (2), 213–225.
- Kita, S. M., 2017a. “Government Doesn’t Have the Muscle”: State, NGOs, Local Politics, and Disaster Risk Governance in Malawi. *Risk, Hazards & Crisis in Public Policy*, 8 (3), 244–267.
- Kita, S. M., 2017b. Urban vulnerability, disaster risk reduction and resettlement in Mzuzu city, Malawi. *International Journal of Disaster Risk Reduction*, 22, 158–166.
- Kita, S. M., 2017c. Can we ‘Build Back Better’? Lessons from floods recovery framework development and implementation in Malawi. In: Johmann, J., ed. *African Perspectives on Disaster Risk Reduction: Working towards a disaster-prepared African continent*. South Africa: Gravitazz Institute.
- Kita, S. M., 2019. Barriers or enablers? Chiefs, elite capture, disasters, and resettlement in rural Malawi. *Disasters*, 43 (1), 135–156.
- Klein, J. A., Tucker, C. M., Steger, C. E., Nolin, A., Reid, R., Hopping, K. A., Yeh, E. T., Pradhan, M. S., Taber, A., Molden, D., Ghate, R., Choudhury, D., Alcántara-Ayala, I., Lavorel, S., Müller, B., Grêt-Regamey, A., Boone, R. B., Bourgeron, P., Castellanos, E., Chen, X., Dong, S., Keiler, M., Seidl, R., Thorn, J., and Yager, K., 2019. An integrated community and ecosystem-based approach to disaster risk reduction in mountain systems. *Environmental Science & Policy*, 94, 143–152.
- Klenk, N., Fiume, A., Meehan, K., and Gibbes, C., 2017. Local knowledge in climate adaptation research: moving knowledge frameworks from extraction to co-production. *Wiley Interdisciplinary Reviews: Climate Change*, 8 (5), e475.

- Kniveton, D., Visman, E., Tall, A., Diop, M., Ewbank, R., Njoroge, E., and Pearson, L., 2015. Dealing with uncertainty: integrating local and scientific knowledge of the climate and weather. *Disasters*, 39 (s1), 35–53.
- Krüger, F., Bankoff, G., Cannon, T., Orlowski, B., and Schipper, E. L. F., 2015. *Cultures and disasters: understanding cultural framings in disaster risk reduction*. London, UK: Routledge.
- Kumar, C., 2005. Revisiting ‘community’ in community-based natural resource management. *Community Development Journal*, 40 (3), 275–285.
- Lambert, S. and Scott, J., 2019. International Disaster Risk Reduction Strategies and Indigenous Peoples. *International Indigenous Policy Journal*, 10 (2), 1–21.
- Langill, S., 1999. *Indigenous knowledge: a resource kit for sustainable development researchers in dryland Africa*. Ontario, Canada: International Development Research Centre.
- Lassa, J. A., Boli, Y., Nakmofa, Y., Fanggidae, S., Ofong, A., and Leonis, H., 2018. Twenty years of community-based disaster risk reduction experience from a dryland village in Indonesia. *Jàmbá : Journal of Disaster Risk Studies*, 10 (1).
- Lavers, T., 2007. *Asking people what they want or telling them what they need? Contrasting a theory of human need with local expression of goals*. Bath, UK: University of Bath.
- Leech, N. L. and Onwuegbuzie, A. J., 2007. An array of qualitative data analysis tools: A call for data analysis triangulation. *School Psychology Quarterly*, 22 (4), 557–584.
- López-Marrero, T. and Tschakert, P., 2011. From theory to practice: building more resilient communities in flood-prone areas. *Environment and Urbanization*, 23 (1), 229–249.
- Ludwig, D., 2016. Overlapping ontologies and Indigenous knowledge. From integration to ontological self-determination. *Studies in History and Philosophy of Science Part A*, 59, 36–45.
- Lumumba Mijoni, P. and Izadkhah, Y. O., 2009. Management of floods in Malawi: case study of the Lower Shire River Valley. *Disaster Prevention and Management: An International Journal*, 18 (5), 490–503.
- Luna, E. M., 2001. Disaster Mitigation and Preparedness: The Case of NGOs in the Philippines. *Disasters*, 25 (3), 216–226.
- Lunga, W. and Musarurwa, C., 2016. Exploiting indigenous knowledge commonwealth to mitigate disasters: from the archives of vulnerable communities in Zimbabwe. *Indian Journal of Traditional Knowledge*, 15 (1).
- Lyall, C. and Meagher, L. R., 2012. A Masterclass in interdisciplinarity: Research into practice in training the next generation of interdisciplinary researchers. *Futures*, 44 (6), 608–617.
- Mabuku, M. P., Senzanje, A., Mudhara, M., Jewitt, G. P. W., and Mulwafu, W. O., 2019. Strategies for coping and adapting to flooding and their determinants: A comparative

- study of cases from Namibia and Zambia. *Physics and Chemistry of the Earth, Parts A/B/C*, 111, 20-34.
- Makate, C., Makate, M., Mango, N., and Siziba, S., 2019. Increasing resilience of smallholder farmers to climate change through multiple adoption of proven climate-smart agriculture innovations. Lessons from Southern Africa. *Journal of Environmental Management*, 231, 858–868.
- Makondo, C. C. and Thomas, D. S. G., 2018. Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation. *Environmental Science & Policy*, 88, 83–91.
- Maksimović, P. Č., Prodanović, A. P. D., Boonya-Aroonnet, R. S., Member, R. S. J. P. L. I., Member, S. L. S. D. I., and Allitt, D. R., 2009. Overland flow and pathway analysis for modelling of urban pluvial flooding. *Journal of Hydraulic Research*, 47 (4), 512–523.
- Manda, M. Z., 2014. Where there is no local government: addressing disaster risk reduction in a small town in Malawi. *Environment and Urbanization*, 26 (2), 586–599.
- Mansuri, G. and Rao, V., 2004. Community-Based and -Driven Development: A Critical Review. *The World Bank Research Observer*, 19 (1), 1–39.
- Manyena, B., O'Brien, G., O'Keefe, P., and Rose, J., 2011. Disaster resilience: a bounce back or bounce forward ability? *Local Environment*, 16 (5), 417–424.
- Manyena, S. B., 2006. The concept of resilience revisited. *Disasters*, 30 (4), 434–450.
- Marfai, M. A., Sekaranom, A. B., and Ward, P., 2015. Community responses and adaptation strategies toward flood hazard in Jakarta, Indonesia. *Natural Hazards*, 75 (2), 1127–1144.
- Marsh, G. and Buckle, P., 2001. Community: The Concept of Community in the Risk and Emergency Management Context. *Australian Journal of Emergency Management*, The, 16 (1), 5.
- Marshall, M. N., 1996. Sampling for qualitative research. *Family Practice*, 13 (6), 522–526.
- Masinde, M., 2015. An innovative drought early warning system for sub-Saharan Africa: integrating modern and indigenous approaches. *African Journal of Science, Technology, Innovation and Development*, 7 (1), 8–25.
- Maskrey, A., 1989. *Disaster mitigation: a community based approach*. Oxford, UK: Oxfam.
- Maskrey, A., 2011. Revisiting community-based disaster risk management. *Environmental Hazards*, 10 (1), 42–52.
- Matsui, K., 2015. Problems of defining and validating traditional knowledge: a historical approach. *The International Indigenous Policy Journal*, 6 (2).
- Mavhura, E. and Manyena, B., 2018. Spatial quantification of community resilience in contexts where quantitative data are scarce: The case of Muzarabani district in Zimbabwe. *Geo: Geography and Environment*, 5 (2), e00065.

- Mavhura, E., Manyena, S. B., Collins, A. E., and Manatsa, D., 2013. Indigenous knowledge, coping strategies and resilience to floods in Muzarabani, Zimbabwe. *International Journal of Disaster Risk Reduction*, 5, 38–48.
- Mayoux, L. and Chambers, R., 2005. Reversing the paradigm: quantification, participatory methods and pro-poor impact assessment. *Journal of International Development*, 17 (2), 271–298.
- McCall, M. . and Peters-Guarin, G., 2012. Participatory action research and disaster risk. In: Wisner, B., Gaillard, J. C., and Kelman, I., eds. *The Routledge Handbook of Hazards and Disaster Risk Reduction*. London, UK: Routledge, 772–786.
- McCallum, I., Liu, W., See, L., Mechler, R., Keating, A., Hochrainer-Stigler, S., Mochizuki, J., Fritz, S., Dugar, S., Arestegui, M., Szoenyi, M., Bayas, J.-C. L., Burek, P., French, A., and Moorthy, I., 2016. Technologies to Support Community Flood Disaster Risk Reduction. *International Journal of Disaster Risk Science*, 7 (2), 198–204.
- Mercer, J., 2010. Disaster risk reduction or climate change adaptation: Are we reinventing the wheel? *Journal of International Development*, 22 (2), 247–264.
- Mercer, J., 2012. Knowledge and disaster risk reduction. In: Wisner, B., Gaillard, J. C., and Kelman, I., eds. *Handbook of Hazards and Disaster Risk Reduction*. London, UK: Routledge, 97–109.
- Mercer, J., Gaillard, J. C., Crowley, K., Shannon, R., Alexander, B., Day, S., and Becker, J., 2012. Culture and disaster risk reduction: Lessons and opportunities. *Environmental Hazards*, 11 (2), 74–95.
- Mercer, J., Kelman, I., and Dekens, J., 2009. Integrating Indigenous and Scientific Knowledge for Disaster Risk Reduction. In: Shaw, R., Sharma, A., and Takeuchi, Y., eds. *Indigenous Knowledge and Disaster Risk Reduction: From Practice to Policy*. New York City, UK: Nova Science Publishers, 115–131.
- Mercer, J., Kelman, I., Lloyd, K., and Suchet-Pearson, S., 2008. Reflections on use of participatory research for disaster risk reduction. *Area*, 40 (2), 172–183.
- Mercer, J., Kelman, I., Taranis, L., and Suchet-Pearson, S., 2010. Framework for integrating indigenous and scientific knowledge for disaster risk reduction. *Disasters*, 34 (1), 214–239.
- Merriam, S. B., Johnson-Bailey, J., Lee, M.-Y., Kee, Y., Ntseane, G., and Muhamad, M., 2001. Power and positionality: negotiating insider/outsider status within and across cultures. *International Journal of Lifelong Education*, 20 (5), 405–416.
- Miles, M. and Huberman, M., 1994. *An expanded sourcebook: qualitative data analysis*. 2nd ed. London, UK: SAGE Publications.
- Miller, J. and Glassner, B., 2016. The ‘inside’ and the ‘outside’: finding realities in interviews. In: Silverman, D., ed. *Qualitative research*. London, UK: SAGE Publications, 51–67.
- Mistry, J. and Berardi, A., 2016. Bridging indigenous and scientific knowledge. *Science*, 352 (6291), 1274–1275.

- Mitchell, A., 2013. *Risk and Resilience: from good idea to good practice*. OECD. Development Co-operation Working Papers No.13. Paris, France: Organisation for Economic-Cooperation and Development
- Mitchell, J. K., O'Neill, K., McDermott, M., and Leckner, M., 2016. Towards a Transformative Role for Local Knowledge in Post-Disaster Recovery: Prospects for Co-Production in the Wake of Hurricane Sandy. *Journal of Extreme Events*, 03 (01), 1650003.
- MoAIWD, 2005. *National Water Policy*. Lilongwe, Malawi: Ministry of Agriculture, Irrigation and Water Development.
- MoAIWD, 2015a. *Operational Decision Support System through enhanced hydro-meteorological services*. Lilongwe, Malawi: Ministry of Agriculture, Irrigation and Water Development.
- MoAIWD, 2015b. *Implementation Service Provides for flood risk management: inception report*. Lilongwe, Malawi: Ministry of Agriculture, Irrigation and Water Development.
- MoAIWD, 2017a. *National guidelines for community-based flood risk management 2nd edition*. Lilongwe, Malawi: Ministry of Agriculture, Irrigation and Water Development.
- MoAIWD, 2017b. *National guidelines for community-based flood risk management 2nd edition Toolbox of measures*. Lilongwe, Malawi: Ministry of Agriculture, Irrigation and Water Development.
- Mochizuki, J., Keating, A., Liu, W., Hochrainer-Stigler, S., and Mechler, R., 2018. An overdue alignment of risk and resilience? A conceptual contribution to community resilience. *Disasters*, 42 (2), 361–391.
- Molina, F. G. J., 2016. Intergenerational Transmission of Local Knowledge Towards River Flooding Risk Reduction and Adaptation: The Experience of Dagupan City, Philippines. In: Miller, M. A. and Douglass, M., eds. *Disaster Governance in Urbanising Asia* [online]. Singapore: Springer Singapore, 145–176.
- Molina, J. G. J. and Neef, A., 2016. Integration of Indigenous Knowledge into Disaster Risk Reduction and Management (DRRM) Policies for Sustainable Development: The Case of the Agta in Casiguran, Philippines. In: Uitto, J. I. and Shaw, R., eds. *Sustainable Development and Disaster Risk Reduction* [online]. Tokyo, Japan: 247–264. Springer
- Moret, W., 2014. *Vulnerability Assessment Methodologies: A Review of the Literature*. Washington DC, USA: USAID.
- Morse, J. M., Barrett, M., Mayan, M., Olson, K., and Spiers, J., 2002. Verification Strategies for Establishing Reliability and Validity in Qualitative Research. *International Journal of Qualitative Methods*, 1 (2), 13–22.
- Mulwafu, W. O. and Msosa, H. K., 2005. IWRM and poverty reduction in Malawi: A socio-economic analysis. *Physics and Chemistry of the Earth, Parts A/B/C*, 30 (11), 961–967.
- Munthali, M. G., Davis, N., Adeola, A. M., Botai, J. O., Kamwi, J. M., Chisale, H. L. W., and Orimoogunje, O. O. I., 2019. Local Perception of Drivers of Land-Use and Land-

- Cover Change Dynamics across Dedza District, Central Malawi Region. *Sustainability*, 11 (3), 832.
- Muriaas, R. L., 2009. Local Perspectives on the ‘Neutrality’ of Traditional Authorities in Malawi, South Africa and Uganda. *Commonwealth & Comparative Politics*, 47 (1), 28–51.
- Mutaqin, D. J., 2019. Determinants of Farmers’ Decisions on Risk Coping Strategies in Rural West Java. *Climate*, 7 (1), 7.
- Mwale, F. D., 2014. Contemporary disaster risk management framework quantification of flood risk in rural Lower Shire Valley, Malawi. PhD. Heriot-Watt University, Edinburgh, United Kingdom.
- Mwale, F. D., Adeloye, A. J., and Beevers, L., 2015. Quantifying vulnerability of rural communities to flooding in SSA: A contemporary disaster management perspective applied to the Lower Shire Valley, Malawi. *International Journal of Disaster Risk Reduction*, 12, 172–187.
- Mwale, F. D., Adeloye, A. J., and Rustum, R., 2014. Application of self-organising maps and multi-layer perceptron-artificial neural networks for streamflow and water level forecasting in data-poor catchments: the case of the Lower Shire floodplain, Malawi. *Hydrology Research*, 45 (6), 838–854.
- Myanmar Red Cross Society, 2013. *Community-based disaster risk reduction: step-by-step methodology*. Naypyidaw, Myanmar: Myanmar Red Cross Society.
- Naess, L. O., 2013. The role of local knowledge in adaptation to climate change. *Wiley Interdisciplinary Reviews: Climate Change*, 4 (2), 99–106.
- National Statistical Office, 2012. *Integrated Household Survey 2010-2011: Household socio-economic characteristics report*. Zomba, Malawi: Government of Malawi.
- National Statistical Office, 2017. *Integrated Household Survey 2016-2017: Household socio-economic characteristics report* [online]. Zomba Malawi: Government of Malawi.
- National Statistical Office, 2018. *2018 Malawu Population and Housing Census Main Report* [online]. Zomba, Malawi: Government of Malawi.
- Ngongondo, C., Xu, C.-Y., Gottschalk, L., and Alemaw, B., 2011. Evaluation of spatial and temporal characteristics of rainfall in Malawi: a case of data scarce region. *Theoretical and Applied Climatology*, 106 (1), 79–93.
- Nguyen, H. and Shaw, R., 2009. Water Resource Management, Climate Change and Indigenous Knowledge. In: *Indigenous Knowledge and Disaster Risk Reduction: From Practice to Policy*. New York: Nova Science Publishers.
- Ngwese, N. M., Saito, O., Sato, A., Boafo, Y. A., and Jasaw, G., 2018. Traditional and Local Knowledge Practices for Disaster Risk Reduction in Northern Ghana. *Sustainability*, 10 (3), 1–17.
- Nicholson, S. E., Klotter, D., and Chavula, G., 2014. A detailed rainfall climatology for Malawi, Southern Africa. *International Journal of Climatology*, 34 (2), 315–325.

- Nightingale, A. J., Eriksen, S., Taylor, M., Forsyth, T., Pelling, M., Newsham, A., Boyd, E., Brown, K., Harvey, B., Jones, L., Kerr, R. B., Mehta, L., Naess, L. O., Ockwell, D., Scoones, I., Tanner, T., and Whitfield, S., 2019. Beyond Technical Fixes: climate solutions and the great derangement. *Climate and Development*.
- Nillson, A., Shela, O., and Chavula, G., 2010. *Flood risk management strategy: mitigation, preparedness, response and recovery*. Lilongwe, Malawi: Department of Disaster Management Affairs.
- Nkomwa, E. C., Joshua, M. K., Ngongondo, C., Monjerezi, M., and Chipungu, F., 2014. Assessing indigenous knowledge systems and climate change adaptation strategies in agriculture: A case study of Chagaka Village, Chikhwawa, Southern Malawi. *Physics and Chemistry of the Earth, Parts A/B/C*, 67–69, 164–172.
- Noble, H. and Smith, J., 2015. Issues of validity and reliability in qualitative research. *Evidence-Based Nursing*, 18 (2), 34–35.
- Nsanje District Council, 2009. *Nsanje socio-economic profile*. Nsanje, Malawi: Government of Malawi.
- Nsanje District Council, 2011. *Nsanje Development Plan*. Nsanje, Malawi: Government of Malawi.
- Nsanje District Council, 2015. *Nsanje District Council Contingency Plan 2015-2016*. Nsanje, Malawi: Government of Malawi.
- Nyong, A., Adesina, F., and Osman Elasha, B., 2007. The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies for Global Change*, 12 (5), 787–797.
- O'Brien, G., Bhatt, M., Saunders, W., Gaillard, J. C., and Wisner, B., 2012. Local government and disaster. In: Wisner, B., Gaillard, J. C., and Kelman, I., eds. *The Routledge Handbook of Hazards and Disaster Risk Reduction*. London, UK: Routledge, 629–641.
- O'Brien, G. and O'Keefe, P., 2014. *Managing Adaptation to Climate Risk: beyond fragmented responses*. London, UK: Routledge.
- O'Brien, G., O'Keefe, P., Rose, J., and Wisner, B., 2006. Climate change and disaster management. *Disasters*, 30 (1), 64–80.
- O'Keefe, P., Westgate, K., and Wisner, B., 1976. Taking the naturalness out of natural disasters. *Nature*, 260, 566–567.
- Oliver-Smith, A., 2016. Disaster risk reduction and applied anthropology. *Annals of Anthropological Practice*, 40 (1), 73–85.
- O'Neil, T. and Cammack, D., 2014. *Fragmented governance and local service delivery in Malawi*. London, UK: Overseas Development Institute.
- Osuret, J., Atuyambe, L. M., Mayega, R. W., Ssentongo, J., Tumuhamy, N., Bua, G. M., Tuhebwe, D., and Bazeyo, W., 2016. Coping Strategies for Landslide and Flood Disasters: A Qualitative Study of Mt. Elgon Region, Uganda. *PLOS Currents Disasters*.

Oulahen, G., Mortsch, L., O'Connell, E., Harford, D., and Rutledge, A., 2019. Local practitioners' use of vulnerability and resilience concepts in adaptation to flood hazards. *Climatic Change*, 153 (1-2), 41-58.

Ouriachi-Peralta, T. and Fakhruddin, S. H. ., 2014. Integrating local knowledge in disaster risk reduction: a case study for Indonesia. *Asian Journal of Environment and Disaster Management*.

Oven, K. J., Shailendra, S., Shubheksha, R., Wisner, B., Ajoy, D., Jones, S., and Densmore, A., 2017. *Review of the nine minimum characteristics of a disaster resilient community in Nepal: final report*. Durham, UK: Durham University.

Owuor, J., 2007. Integrating African Indigenous Knowledge in Kenya's Formal Education System: The Potential for Sustainable Development. *Journal of Contemporary Issues in Education*, 2 (2), 21-37.

Oxley, M. C., 2013. A "People-centred Principles-based" post-Hyogo framework to strengthen the resilience of nations and communities. *International Journal of Disaster Risk Reduction*, 4, 1-9.

Palamuleni, L. G., Ndomba, P. M., and Annegarn, H. J., 2011. Evaluating land cover change and its impact on hydrological regime in Upper Shire river catchment, Malawi. *Regional Environmental Change*, 11 (4), 845-855.

Pandey, B. and Okazani, K., n.d. Community based disaster management: empowering communities to cope with disaster risks. [online]. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.467.1932&rep=rep1&type=pdf> [Accessed 8 Mar 2016].

Pandey, C. L., 2018. Making communities disaster resilient: Challenges and prospects for community engagement in Nepal. *Disaster Prevention and Management: An International Journal*, 28 (1), 106-118.

Pangapanga, P., Jumbe, C., Kanyanda, S., and Thangalimodzi, L., 2012. Policy implications of droughts and floods adaptation on household crop production and food security in Southern Malawi. *British Journal of Environment and Climate Change*, 2 (3), 245-258.

Paul, J. D., Buytaert, W., Allen, S., Ballesteros-Cánovas, J. A., Bhusal, J., Cieslik, K., Clark, J., Dugar, S., Hannah, D. M., Stoffel, M., Dewulf, A., Dhital, M. R., Liu, W., Nayaval, J. L., Neupane, B., Schiller, A., Smith, P. J., and Supper, R., 2018. Citizen science for hydrological risk reduction and resilience building. *Wiley Interdisciplinary Reviews: Water*, 5 (1), e1262.

Paul, S. K. and Routray, J. K., 2010. Flood proneness and coping strategies: the experiences of two villages in Bangladesh. *Disasters*, 34 (2), 489-508.

Pauw, K., Thurlow, J., Bachu, M., and Seventer, D. E. V., 2011. The economic costs of extreme weather events: a hydrometeorological CGE analysis for Malawi. *Environment and Development Economics*, 16 (2), 177-198.

Pearce, L., 2003. Disaster Management and Community Planning, and Public Participation: How to Achieve Sustainable Hazard Mitigation. *Natural Hazards*, 28 (2), 211-228.

- Pelling, M., 1998. Participation, social capital and vulnerability to urban flooding in Guyana. *Journal of International Development*, 10 (4), 469–486.
- Pelling, M., 2007. Learning from others: the scope and challenges for participatory disaster risk assessment. *Disasters*, 31 (4), 373–385.
- Penya, J. and Nyirongo, J., 2011. *Who controls development? NGOs, accountability and power in rural Malawi Working Paper no.28*. London, UK: Aon Benfield UCL Hazard Centre.
- Phiri, M. G. and Saka, R., 2008. The Impact of Changing Environmental Conditions on Vulnerable Communities in the Shire Valley, Southern Malawi. In: Lee, C. and Schaaf, T., eds. *The Future of Drylands*. Springer Netherlands, 545–559.
- Platteau, J.-P., 2004. Monitoring Elite Capture in Community-Driven Development. *Development and Change*, 35 (2), 223–246.
- Plotz, R. D., Chambers, L. E., and Finn, C. K., 2017. The Best of Both Worlds: A Decision-Making Framework for Combining Traditional and Contemporary Forecast Systems. *Journal of Applied Meteorology and Climatology*, 56 (8), 2377–2392.
- Pottier, J., 2003. Negotiating local knowledge: an introduction. In: Pottier, J., Bicker, A., and Sillitoe, P., eds. *Negotiating local knowledge: power and identity in development*. London, UK: Pluto Press, 1–30.
- Quarantelli, E. L., 2000. Disaster Planning, Emergency Management and Civil Protection: The Historical Development of Organized Efforts to Plan For and to Respond to Disasters. Delaware, USA: University of Delaware Disaster Research Centre.
- Rahman, A., Sakurai, A., and Munadi, K., 2018. The analysis of the development of the Smong story on the 1907 and 2004 Indian Ocean tsunamis in strengthening the Simeulue island community's resilience. *International Journal of Disaster Risk Reduction*, 29, 13–23.
- Rautela, P., 2005. Indigenous technical knowledge inputs for effective disaster management in the fragile Himalayan ecosystem. *Disaster Prevention and Management: An International Journal*, 14 (2), 233–241.
- Raymond, C. M., Fazey, I., Reed, M. S., Stringer, L. C., Robinson, G. M., and Evely, A. C., 2010. Integrating local and scientific knowledge for environmental management. *Journal of Environmental Management*, 91 (8), 1766–1777.
- Reardon, T. and Vosti, S. A., 1995. Links between rural poverty and the environment in developing countries: Asset categories and investment poverty. *World Development*, 23 (9), 1495–1506.
- Romero Manrique, D., Corral, S., and Guimarães Pereira, Â., 2018. Climate-related displacements of coastal communities in the Arctic: Engaging traditional knowledge in adaptation strategies and policies. *Environmental Science & Policy*, 85, 90–100.
- Rose, J. and Jayawickrama, J., 2016. Capacity building of institutions for disaster risk reduction: Learning from communities as first responders. *Built Environment Project and Asset Management*, 6 (4), 391–402.

- Roue, M. and Nakashima, D., 2018. Indigenous and Local Knowledge and Science: From Validation to Knowledge Coproduction. *In: Callan, H. The International Encyclopedia of Anthropology*. John Wiley and Sons, Ltd. 1-11.
- Rudari, R., Beckers, J., De Angeli, S., Rossi, L., and Trasforini, E., 2016. Impact of modelling scale on probabilistic flood risk assessment: the Malawi case. *In: Lang, M., Klijn, F., and Samuels, P., eds. E3S Web of Conferences*. 04015.
- Ruszczuk, H., 2017. The everyday and events: understanding risk perceptions and resilience in urban Nepal. PhD Thesis. Durham University, Durham, UK.
- Ruszczuk, H. A., 2019. Ambivalence towards discourse of disaster resilience. *Disasters*, 4 (43). 818-839.
- Šakić Trogrlić, R. and van den Homberg, M., 2018. *Indigenous knowledge and early warning systems in the Lower Shire Valley in Malawi*. Den Hague, The Netherlands: 510 Data Team.
- Šakić Trogrlić, R., Wright, G. B., Adeloye, A. J., and Duncan, M. J., 2017. Community based- flood risk management: experiences and challenges in Malawi. *In: . Presented at the XVI International Water Resources Association World Water Congress, Cancun, Mexico: IWRA*.
- Šakić Trogrlić, R., Wright, G. B., Adeloye, A. J., Duncan, M. J., and Mwale, F., 2018. Taking stock of community-based flood risk management in Malawi: different stakeholders, different perspectives. *Environmental Hazards*, 17 (2), 107–127.
- Šakić Trogrlić, R., Wright, G. B., Duncan, M. J., van den Homberg, M. J. C., Adeloye, A. J., Mwale, F. D., and Mwafulirwa, J., 2019. Characterising Local Knowledge across the Flood Risk Management Cycle: A Case Study of Southern Malawi. *Sustainability*, 11 (6), 1681.
- Salite, D., 2019a. Traditional prediction of drought under weather and climate uncertainty: analyzing the challenges and opportunities for small-scale farmers in Gaza province, southern region of Mozambique. *Natural Hazards*, 96 (3), 1289–1309.
- Salite, D., 2019b. Explaining the uncertainty: understanding small-scale farmers' cultural beliefs and reasoning of drought causes in Gaza Province, Southern Mozambique. *Agriculture and Human Values*, 36 (3), 427–441.
- Sandelowski, M., 1995. Sample size in qualitative research. *Research in Nursing & Health*, 18 (2), 179–183.
- Santha, S. D., Gahana, P., and Aswin, V., 2014. Local knowledge, early warning and coastal hazards: Participatory inquiry among fishworkers in Kerala, India. *Action Research*, 12 (3), 273–292.
- Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., and Jinks, C., 2018. Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity*, 52 (4), 1893–1907.
- Saunders, M., Lewis, P., and Thornhill, A., 2016a. Collecting primary data using semi-structured, in-depth and group interviews. *In: Saunders, M., Lewis, P., and Thornhill, A., eds. Research methods for business students*. Essex, UK: Pearson Education Limited.

- Saunders, M., Lewis, P., and Thornhill, A., 2016b. Formulating the research design. *In: Saunders, M., Lewis, P., and Thornhill, A., eds. Research methods for business students.* Essex, UK: Pearson Education Limited, 162–220.
- Saunders, M., Lewis, P., Thornhill, A., and Bristow, A., 2016. Understanding research philosophy and approaches to theory development. *In: Saunders, M., Lewis, P., and Thornhill, A., eds. Research methods for business students.* Essex, UK: Pearson Education Limited, 122–162.
- Schanze, J., 2006. Flood risk management: a basic framework. *In: Schanze, J., Zeman, E., and Marsalek, J., eds. Flood Risk Management: Hazards, Vulnerability and Mitigation Measures.* Dordrecht, The Netherlands: Springer Netherlands, 1–20.
- Scolobig, A., Prior, T., Schröter, D., Jörin, J., and Patt, A., 2015. Towards people-centred approaches for effective disaster risk management: Balancing rhetoric with reality. *International Journal of Disaster Risk Reduction*, 12, 202–212.
- Scussolini, P., Aerts, J. C. J. H., Jongman, B., Bouwer, L. M., Winsemius, H. C., de Moel, H., and Ward, P. J., 2016. FLOPROS: an evolving global database of flood protection standards. *Natural Hazards and Earth System Sciences*, 16 (5), 1049–1061.
- Seale, C., 1999. Quality in Qualitative Research. *Qualitative Inquiry*, 5 (4), 465–478.
- Seidler, R., Dietrich, K., Schweizer, S., Bawa, K. S., Chopde, S., Zaman, F., Sharma, A., Bhattacharya, S., Devkota, L. P., and Khaling, S., 2018. Progress on integrating climate change adaptation and disaster risk reduction for sustainable development pathways in South Asia: Evidence from six research projects. *International Journal of Disaster Risk Reduction*, 31, 92–101.
- Shah, A. A., Ye, J., Abid, M., Khan, J., and Amir, S. M., 2018. Flood hazards: household vulnerability and resilience in disaster-prone districts of Khyber Pakhtunkhwa province, Pakistan. *Natural Hazards*, 93 (1), 147–165.
- Shaw, R., 2006. Critical issues of community based flood mitigation: examples from Bangladesh and Japan. *Journal of Science and Culture*, 72 (1–2), 1–17.
- Shaw, R., 2012a. Future Perspectives of Community-Based Disaster Risk Reduction. *In: Shaw, R., ed. Community-based disaster risk reduction.* Bingley, UK: Emerald Group Publishing Limited, 389–402.
- Shaw, R., 2012b. Community-Based Disaster Risk Reduction. *In: Shaw, R., ed. Community-based disaster risk reduction.* Bingley, UK: Emerald Group Publishing Limited, 1–12.
- Shaw, R., 2014. Disaster risk reduction and community-approaches. *In: Shaw, R., ed. Community practices for disaster risk reduction in Japan.* Tokyo Heidelberg New York Dordrecht London: Springer, 3–20.
- Shaw, R., 2016. Community-Based Disaster Risk Reduction. *In: Oxford Research Encyclopedia of Natural Hazard Science* [online]. Available from: <http://oxfordre.com/view/10.1093/acrefore/9780199389407.001.0001/acrefore-9780199389407-e-47> [Accessed 11 Apr 2019].

- Shaw, R., Sharma, A., and Takeuchi, Y., 2009a. Introduction: Indigenous knowledge and disaster risk reduction. *In: Shaw, R., Sharma, A., and Takeuchi, Y., eds. Indigenous knowledge and disaster risk reduction: from practice to policy.* New York City, USA: Nova Science Publishers, 1–13.
- Shaw, R., Sharma, A., and Takeuchi, Y., eds., 2009b. *Indigenous knowledge and disaster risk reduction: from practice to policy.* New York City, USA: Nova Science Publishers.
- Shaw, R., Thi My Thi, T., Tran, P., and Nguyen, H., 2012. Community-Based Disaster Risk Reduction in Vietnam. *In: Shaw, R., ed. Community-Based Disaster Risk Reduction.* Bingley, UK: Emerald Group Publishing Limited, 255–273.
- Shela, O., Thompson, G., Jere, P., and Annandale, G., 2008. *Analysis of Lower Shire Floods: A flood risk reduction and recovery programme proposal.* Lilongwe, Malawi: Department of Disaster Management Affairs.
- Sherman, M. H. and Ford, J., 2014. Stakeholder engagement in adaptation interventions: an evaluation of projects in developing nations. *Climate Policy*, 14 (3), 417–441.
- Sillitoe, P., 1998a. What, know natives? Local knowledge in development. *Social Anthropology*, 6 (2), 203–220.
- Sillitoe, P., 1998b. The Development of Indigenous Knowledge: A New Applied Anthropology. *Current Anthropology*, 39 (2), 223–252.
- Sillitoe, P., 2000. The state of indigenous knowledge in Bangladesh. *In: Sillitoe, P., ed. Indigenous knowledge development in Bangladesh: present and future.* London: Intermediate Technology Publications Limited, 3–23.
- Sillitoe, P., 2003. Globalizing indigenous knowledge. *In: Bicker, A., Pottier, J., Sillitoe, P. Participating in Development.* London, UK: Routledge, 108–138.
- Sillitoe, P., 2004. Interdisciplinary experiences: working with indigenous knowledge in development. *Interdisciplinary Science Reviews*, 29 (1), 6–23.
- Sim, T., Dominelli, L., and Lau, J., 2017. A pathway to initiate bottom-up community-based disaster risk reduction within a top-down system: The case of China. *International Journal of Safety and Security Engineering*, 7 (3), 283–293.
- Simelton, E., Quinn, C. H., Batisani, N., Dougill, A. J., Dyer, J. C., Fraser, E. D. G., Mkwambisi, D., Sallu, S., and Stringer, L. C., 2013. Is rainfall really changing? Farmers' perceptions, meteorological data, and policy implications. *Climate and Development*, 5 (2), 123–138.
- Skoufias, E., 2003. Economic Crises and Natural Disasters: Coping Strategies and Policy Implications. *World Development*, 31 (7), 1087–1102.
- Smit, B. and Wandel, J., 2006. Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, 16 (3), 282–292.
- Smith, R.-A. J. and Rhiney, K., 2016. Climate (in)justice, vulnerability and livelihoods in the Caribbean: The case of the indigenous Caribs in northeastern St. Vincent. *Geoforum*, 73, 22–31.

- Smith, T. A., 2011. Local Knowledge in Development (Geography). *Geography Compass*, 5 (8), 595–609.
- Sonia Lin, P.-S. and Chang, K.-M., 2019. Metamorphosis from local knowledge to involuted disaster knowledge for disaster governance in a landslide-prone tribal community in Taiwan. *International Journal of Disaster Risk Reduction*, 101339.
- Sutcliffe, C., Dougill, A. J., and Quinn, C. H., 2016. Evidence and perceptions of rainfall change in Malawi: Do maize cultivar choices enhance climate change adaptation in sub-Saharan Africa? *Regional Environmental Change*, 16 (4), 1215–1224.
- Swanborn, P., 2010. *Case study research: what, why and how?* London, UK: SAGE Publications.
- Takagi, H., Esteban, M., Mikami, T., and Fujii, D., 2016. Projection of coastal floods in 2050 Jakarta. *Urban Climate*, 17, 135–145.
- Takeuchi, Y. and Shaw, R., 2009. Indigenous knowledge for river management and flood control in Japan. In: Shaw, R., Sharma, A., and Takeuchi, Y., eds. *Indigenous Knowledge and Disaster Risk Reduction: From Practice to Policy*. New York City: Nova Science Publishers, 283–292.
- Tanoue, M., Hirabayashi, Y., and Ikeuchi, H., 2016. Global-scale river flood vulnerability in the last 50 years. *Scientific Reports*, 6, 36021.
- Tanwattana, P., 2018. Systematizing Community-Based Disaster Risk Management (CBDRM): Case of urban flood-prone community in Thailand upstream area. *International Journal of Disaster Risk Reduction*, 28, 798–812.
- Tchale, H., 2009. The efficiency of smallholder agriculture in Malawi. *African Journal of Agricultural and Resource Economics*, 03 (2), 1–21.
- Tengö, M., Brondizio, E. S., Elmqvist, T., Malmer, P., and Spierenburg, M., 2014. Connecting Diverse Knowledge Systems for Enhanced Ecosystem Governance: The Multiple Evidence Base Approach. *AMBIO*, 43 (5), 579–591.
- The World Bank, 2017. *Malawi / Data* [online]. Available from: <https://data.worldbank.org/country/malawi> [Accessed 15 Jul 2019].
- Thi My Thi, T., Nguyen, H., Shaw, R., and Tran, P., 2012. Community based disaster risk reduction in Vietnam. In: Shaw, R., ed. *Community-based disaster risk reduction*. Bingley, UK: Emerald Group Publishing Limited, 255–273.
- Thomalla, F., Downing, T., Spanger-Siegfried, E., Han, G., and Rockström, J., 2006. Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation. *Disasters*, 30 (1), 39–48.
- Tierney, K., 2015. Resilience and the Neoliberal Project: Discourses, Critiques, Practices—And Katrina. *American Behavioral Scientist*, 59 (10), 1327–1342.
- Titz, A., Cannon, T., and Krüger, F., 2018. Uncovering ‘Community’: Challenging an Elusive Concept in Development and Disaster Related Work. *Societies*, 8 (3), 71.

- Tobi, H. and Kampen, J. K., 2018. Research design: the methodology for interdisciplinary research framework. *Quality & Quantity*, 52 (3), 1209–1225.
- Ton, K. T., Gaillard, J. C., Cadag, J. R., and Naing, A., 2017. It takes two to tango: integrating meteorological knowledge and actions for disaster risk reduction. *Climate and Development*, 9 (6), 479–492.
- Tozier de la Poterie, A. and Baudoin, M.-A., 2015. From Yokohama to Sendai: Approaches to Participation in International Disaster Risk Reduction Frameworks. *International Journal of Disaster Risk Science*, 6 (2), 128–139.
- Tran, P., Shaw, R., Chantry, G., and Norton, J., 2009. GIS and local knowledge in disaster management: a case study of flood risk mapping in Viet Nam. *Disasters*, 33 (1), 152–169.
- Tran, P., Takeuchi, Y., and Shaw, R., 2009. Indigenous knowledge in river basin management. In: Shaw, R., Sharma, A., and Takeuchi, Y., eds. *Indigenous knowledge and disaster risk reduction: from policy to practice*. New York City, USA: Nova Science Publishers, 45–57.
- Turner, D., 2010. Qualitative Interview Design: A Practical Guide for Novice Investigators. *The Qualitative Report*, 15 (3), 754–760.
- Twigg, J., 1999. The Age of Accountability?: Future Community Involvement in Disaster Reduction. *Australian Journal of Emergency Management, The*, 14 (4), 51.
- Twigg, J., 2001. *Sustainable Livelihoods and Vulnerability to Disasters*. London, UK: Benfield Greig Hazard Research Centre University College London.
- Twigg, J., 2009. *Characteristics of a disaster-resilient community; a guidance note Version 2*. London, UK: Interagency Group [ActionAid, British Red Cross, Christian Aid, Practical Action, Plan UK and Tearfund].
- Twigg, J., 2015. *Disaster Risk Reduction- Good Practice Review 9*. 2nd ed. London, UK: Overseas Development Institute.
- Twigg, J., Kett, M., and Lovell, E., 2018. *Disability inclusion and disaster risk reduction*. London, UK: Overseas Development Institute.
- UNDP, 2008. *Indigenous knowledge in disaster management in Africa*. Nairobi, Kenya: United Nations Development Programme.
- UNDP, 2015. Strengthening climate information in Malawi. [online]. Available from: <https://www.undp.org/content/undp/en/home/presscenter/articles/2015/11/19/strengthening-climate-information-in-malawi.html> [Accessed 3 Mar 2019].
- UNDP Pakistan, 2007. *Community-based disaster risk management: participants workbook*. Islamabad Pakistan: UNDP Pakistan.
- UNDRR, 2005. *Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters*. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction.

UNDRR, 2010. *Local governments and disaster risk reduction: good practices and lessons learned*. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction.

UNDRR, 2015. *Sendai Framework for Disaster Risk Reduction 2015-2030*. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction.

UNDRR, 2016. *Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction* [online]. New York: United Nations. Available from: <https://www.unisdr.org/we/inform/publications/51748> [Accessed 8 May 2019].

UNECA, 2015. *Assessment report on mainstreaming and implementing disaster risk reduction measures in Malawi*. Addis Ababa, Ethiopia: United Nations Economic Commission for Africa.

UNFCCC, 2015. *Paris Agreement*. Paris, France: United Nations Framework Convention on Climate Change.

Van Der Walddt, G., 2009. Public Management and Disaster Risk Reduction : potential interdisciplinary contributions. *Jamba: Journal of Disaster Risk Studies*. 2(1), 14-27.

Van Niekerk, D. and Annandale, E., 2013. Utilising Participatory Research Techniques For Community-Based Disaster Risk Assessment - International Journal of Mass Emergencies and Disasters. *International Journal of Mass Emergencies and Disasters*, 31 (2), 160–177.

Van Niekerk, D. and Coetzee, C., 2012. African Experiences in Community-Based Disaster Risk Reduction. In: Shaw, R., ed. *Community-based disaster risk reduction*. Bingley, UK: Emerald Group Publishing Limited, 333–349.

Van Niekerk, D., Nemaconde, L. D., Kruger, L., and Forbes-Genade, K., 2018. Community-Based Disaster Risk Management. In: Rodríguez, H., Donner, W., and Trainor, J. E., eds. *Handbook of Disaster Research*. Cham, Switzerland: Springer International Publishing, 411–429.

Vickery, J., 2018. Using an intersectional approach to advance understanding of homeless persons' vulnerability to disaster. *Environmental Sociology*, 4 (1), 136–147.

Victoria, L., 2003. *Community based approaches to disaster mitigation*. Bangkok, Thailand: Asian Disaster Preparedness Centre.

Vincent, K., Dougill, A. J., Dixon, J. L., Stringer, L. C., and Cull, T., 2017. Identifying climate services needs for national planning: insights from Malawi. *Climate Policy*, 17 (2), 189–202.

Vogel, C. and O'Brien, K., 2004. *Vulnerability and global environmental change: rhetoric and reality*. Information Bulletin on Global Environmental Change and Human Security, Issue No. 13. Ottawa, Canada: International Human Dimensions Programme on Global Environmental Change.

Vojinovic, Z. and Abbot, M., 2012. *Flood risk and social justice: from quantitative to qualitative flood risk assessment and mitigation*. London, UK: IWA Publishing.

- Walshe, R. A. and Nunn, P. D., 2012. Integration of indigenous knowledge and disaster risk reduction: A case study from Baie Martelli, Pentecost Island, Vanuatu. *International Journal of Disaster Risk Science*, 3 (4), 185–194.
- Wamsler, C., 2010. Reducing risk in a changing climate: Changing Paradigms toward Urban Pro-Poor Adaptation. *Open House International*, 35 (1).
- Wamsler, C. and Brink, E., 2014. Moving beyond short-term coping and adaptation. *Environment and Urbanization*, 26 (1), 86–111.
- Warnatzsch, E. A. and Reay, D. S., 2019. Temperature and precipitation change in Malawi: Evaluation of CORDEX-Africa climate simulations for climate change impact assessments and adaptation planning. *Science of The Total Environment*, 654, 378–392.
- Warren, D. M., 1991. *Using indigneous knowledge in agricultural development: Discussion Paper No.127*. Washington, DC: World Bank Group.
- Waylen, K. and Martin-Ortega, J., 2013. *Report on knowledge exchange workshops on an ecosystem services approach*. Aberdeen, United Kingdom: The James Hutton Institute.
- Weichselgartner, J., 2001. Disaster mitigation: the concept of vulnerability revisited. *Disaster Prevention and Management: An International Journal*, 10 (2), 85–95.
- Weichselgartner, J. and Kelman, I., 2015. Geographies of resilience: Challenges and opportunities of a descriptive concept. *Progress in Human Geography*, 39 (3), 249–267.
- Weichselgartner, J. and Obersteiner, M., 2002. Knowing sufficient and applying more: challenges in hazards management. *Global Environmental Change Part B: Environmental Hazards*, 4 (2), 73–77.
- Weichselgartner, J. and Pigeon, P., 2015. The Role of Knowledge in Disaster Risk Reduction. *International Journal of Disaster Risk Science*, 6 (2), 107–116.
- White, G., 1945. *Human adjustments to floods*. Chicago, United States: University of Chicago.
- White, S. C., 1996. Depoliticising development: The uses and abuses of participation. *Development in Practice*, 6 (1), 6–15.
- WHO, 2015. *Managing disaster risk in communities: a community-based approach to disaster risk reduction*. Cairo, Egypt: Regional Office for the Eastern Mediterranean: World Health Organisation.
- Winsemius, H. C., Aerts, J. C. J. H., van Beek, L. P. H., Bierkens, M. F. P., Bouwman, A., Jongman, B., Kwadijk, J. C. J., Ligtoet, W., Lucas, P. L., van Vuuren, D. P., and Ward, P. J., 2016. Global drivers of future river flood risk. *Nature Climate Change*, 6 (4), 381–385.
- Wisner, B., 1978. The human ecology of drought in Eastern Kenya. PhD. Clark University, Worcester, USA.
- Wisner, B., 2009. *Local Knowledge and Disaster Risk Reduction: Keynote during the Side Meeting on Indigenous Knowledge, Global Platform for Disaster Reduction* [online].

- [online]. Available from: http://www.radixonline.org/resources/WisnerLocalKnowledgeDRR_25-6-09.doc.
- Wisner, B., 2016. Vulnerability as Concept, Model, Metric, and Tool. In: *Oxford Research Encyclopedia of Natural Hazard Science* [online]. Available from: <http://oxfordre.com/view/10.1093/acrefore/9780199389407.001.0001/acrefore-9780199389407-e-25> [Accessed 26 Mar 2019].
- Wisner, B., Blaikie, P., Cannon, T., and Davis, I., 2004. *At risk: natural hazards, people's vulnerability and disasters*. 2nd ed. London, UK: Routledge.
- Wisner, B., Gaillard, J. C., and Kelman, I., 2012. *The Routledge handbook of hazards and disaster risk reduction*. 1st ed. London, UK: Routledge.
- Wisner, B. and Luce, H. R., 1993. Disaster Vulnerability: Scale, Power and Daily Life. *GeoJournal*, 30 (2), 127–140.
- Wisner, B., O'Keefe, P., and Westgate, K., 1977. Global Systems and Local Disasters: The Untapped Power of Peoples' Science. *Disasters*, 1 (1), 47–57.
- WMO, 2017. *Integrated flood risk management tools series: community-based flood management*. Geneva, Switzerland: World Meteorological Organisation.
- WMO/EHA, 2002. *Disasters and emergencies: definitions* [online]. Addis Ababa, Ethiopia: WMO/EHA. Available from: <http://apps.who.int/disasters/repo/7656.pdf>.
- World Bank, 2010. *Disaster Risk Management in Malawi- The Country Note*. Washington DC, USA: World Bank Group.
- World Bank, 2013. *World Development Report 2014 : Risk and Opportunity—Managing Risk for Development*. Washington DC, USA: The World Bank.
- Worldometers, 2019. *Malawi Population (2019) - Worldometers* [online]. Available from: <https://www.worldometers.info/world-population/malawi-population/> [Accessed 14 Aug 2019].
- Wrachien, D. D., Mambretti, S., and Schultz, B., 2011. Flood management and risk assessment in flood-prone areas: Measures and solutions. *Irrigation and Drainage*, 60 (2), 229–240.
- Yin, R. K., 2009a. *Case study research: design and methods*. 4th ed. London, UK: SAGE Publications.
- Yin, R. K., 2009b. How to do better case studies (with illustrations from 20 exemplary case studies). In: Bickman, L. and Rog, D., eds. *The SAGE Handbook of applied social research methods*. London, UK: SAGE Publications, 254–283.
- Yin, R. K., 2014. *Case study research: design and methods*. 5. edition. Los Angeles London New Delhi Singapore Washington, DC: SAGE Publications.